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ABSTRACT

In accordance with a mandate included in the 1990 amendments to the Perkins Act, a national evaluation of Tech-Prep implementation was conducted. The evaluation had two main objectives: to determine how effectively Tech-Prep is being implemented and to identify useful implementation practices and challenges. Data were collected from the following sources: surveys of state-level Tech-Prep coordinators in autumn 1993 and spring 1997; surveys of all local Tech-Prep consortium coordinators in autumn 1993, 1994, and 1995; and in-depth studies of 10 local consortia that involved 4 visits to each site and a follow-up survey of a sample of Tech-Prep participants in selected member high schools (the survey was completed by 61% of the sample of 799 students). The evaluation yielded three main conclusions: (1) Tech-Prep consortia have strengthened local collaboration among educators, increased emphasis on career guidance, focused attention on applied forms of academic instruction, and brought employers into more contact with schools; (2) Tech-Prep has taken diverse forms; and (3) federal and state leadership could strengthen Tech-Prep by placing greater emphasis on comprehensive programs of study. (Twenty tables/figures are included. The report contains 23 references.) (MN)

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FOCUS FOR THE FUTURE

The Final Report of the National Tech-Prep Evaluation

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The Final Report of the National Tech-Prep Evaluation

1998

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Many more staff members contributed to the report at Mathematica Policy Research, Inc., than are listed as authors. Pat Nemeth expertly directed both the consortium and student surveys. Allen Dupree assisted in the analysis of the survey data. Patricia Ciaccio and her staff edited this report and earlier ones. Jill Miller and Jennifer Baskwell have provided expert production support. The final conclusions expressed in the report, of course, are those of the authors themselves.

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EXECUTIVE SUMMARY

In 1990, amendments to the Carl D. Perkins Vocational Education Act of 1984 created Title IIIE, the Tech-Prep Education Act. This legislation responded to widespread concerns that many American high school students were failing to develop the academic and technical skills they would need to succeed in an increasingly technological labor market and competitive world economy. Under Title IIIE, more than $568 million in federal funding has been apportioned among the states from 1991 through 1997. As required, states have used most of these funds to support local consortia of school districts and postsecondary educational institutions. These consortia are responsible for implementing Tech-Prep.

This report presents final results from a national evaluation of Tech-Prep implementation mandated by the federal legislation. The evaluation was conducted by Mathematica Policy Research, Inc. and its subcontractor, Northwest Regional Educational Laboratory. The evaluation had two main objectives: to describe how effectively Tech-Prep was implemented and to identify useful implementation practices and challenges. Evaluation findings draw on data from (1) surveys of state-level Tech-Prep coordinators, in fall 1993 and spring 1997; (2) surveys of all local Tech-Prep consortium coordinators, in fall 1993, 1994, and 1995; and (3) in-depth studies of 10 local consortia, based on four visits to each site and a follow-up survey of a sample of Tech-Prep participants in selected member high schools.

The evaluation reached three main conclusions:

- ***The creation of Tech-Prep consortia has had important benefits.*** Consortia have been effective in strengthening local collaboration among educators, increasing emphasis on career guidance, focusing attention on applied forms of academic instruction, and bringing employers into more contact with schools.

- ***Tech-Prep has taken diverse forms.*** Most consortia have emphasized individual components of Tech-Prep; few have stressed comprehensive, career-focused programs combining academic and vocational instruction for identified students who consciously choose the program. Federal legislation specified the components of Tech-Prep, but allowed discretion in how they are combined for individual students. Most consortia have implemented particular aspects of Tech-Prep (such as articulation or applied academic instruction) but have not brought them together in structured, challenging programs of study that substantially change students' educational experience.

- ***Federal and state leadership could strengthen Tech-Prep by placing greater emphasis on comprehensive programs of study.*** By implementing individual, often unconnected elements of Tech-Prep, most consortia have foregone the chance to change students' experiences substantially, and have put only modest emphasis on promoting the anticipated seamless transition from the secondary to the postsecondary stage of Tech-Prep. The more structured program approach has a better chance of improving student learning and postsecondary transitions. Federal and state leadership could encourage

local consortia to adopt a more structured, comprehensive program as the model for Tech-Prep implementation.

We present these findings in greater detail here. First we discuss the program goals that motivated the Title IIIE amendments to the Perkins Act. Later sections of this executive summary review the basic components of Tech-Prep, the diverse ways in which it has been implemented, and levels of student participation and rates of transition to the postsecondary stage of Tech-Prep. We identify the positive accomplishments that can be attributed to Tech-Prep implementation efforts, assess how specific forms of Tech-Prep implementation appear to influence the prospects for long-term effects on students, and offer ideas on how to strengthen the program in the future.

GOALS OF THE TECH-PREP PROGRAM

Tech-Prep programs were formulated in the 1980s as a promising strategy to help students, particularly those in the middle range of school performance, prepare better for future careers. During the 1980s, several publications focused national attention on the need to develop a more skilled U.S. workforce to ensure America's place in the global economy (National Commission on Excellence in Education 1983; and National Center on Education and the Economy 1990). Emerging evidence suggested that students unlikely to earn a four-year college degree were particularly at risk of failing to meet employers' rising expectations. Postsecondary education and training were increasingly viewed as important ingredients in these students' labor market success and in the acceleration of U.S. economic development (Parnell 1985; and William T. Grant Foundation 1988).

The Tech-Prep Education Act reflects these concerns. It emphasizes improving the technical and basic academic skills of American youth and the contribution that linkages between secondary and postsecondary institutions--particularly community colleges--can make in achieving these outcomes. The legislation acknowledges that traditional educational approaches may not have served all students well. It outlines a strategy intended to:

- Make high school a more coherent foundation for further education and employment
- Introduce higher standards in both academic and vocational courses
- Increase students' motivation to pursue the further education they would likely need for career success, particularly in high-demand, technically oriented occupations

THE DEFINITION OF TECH-PREP

Tech-Prep evolved from efforts to reform vocational education. Early proponents viewed Tech-Prep as an alternative to both the traditional college-prep and general education tracks (Parnell 1985 and 1991). They envisioned Tech-Prep as a structured, planned program of study that would combine academic and vocational courses and link high school studies to advanced technical

education in community colleges, technical colleges, apprenticeship programs, or other postsecondary institutions. Students would consciously choose Tech-Prep, committing themselves to a program with a broadly defined career focus running through the latter years of high school and two years of more specialized postsecondary education. Tech-Prep programs would include applied academic instruction--teaching academic materials in a practical, hands-on way--and the development of clearly defined technical and academic competencies. Instead of watering down or neglecting academic content, schools were to find effective ways to teach students who learn best through tangible experience.

The federal Tech-Prep legislation required local programs to include specific program components, following for the most part ideas described by early Tech-Prep proponents:

- ***A "2 + 2" design,*** in which a common core of math, science, communications (including applied academics), and technology is defined for the last two years of high school, as a basis for two years of more specialized courses at the postsecondary level--usually in community colleges. Later regulation changes allowed consortia to develop Tech-Prep course sequences as early as ninth grade.

- ***Articulation agreements*** between secondary and postsecondary institutions to create a "seamless" program sequence. By aligning, or "articulating," secondary and postsecondary curricula, the programs would eliminate redundancies between college and high school courses and promote teaching of more advanced skills at community colleges.

- ***Preparatory services*** (such as recruiting and counseling) to help students understand the Tech-Prep option, formulate a career goal, and make informed program and course choices.

- ***Development of curricula*** for Tech-Prep programs, teacher training on how to use the new curriculum, and counselor training on how to recruit students for Tech-Prep programs and guide them through to completion.

The legislation did not, however, specify how these components should be linked together or the relative emphasis to be placed on each. States, local consortia, and individual member schools could find in the legislation the latitude to define their Tech-Prep programs in quite different ways, based on their own circumstances, resources, and constraints.

THE DIVERSE FORMS OF TECH-PREP IMPLEMENTATION

Tech-Prep concepts have been widely introduced throughout the United States. With the help of Title IIIE funding, states have overseen the creation of more than 1,000 local consortia. These consortia include about 70 percent of all school districts, which in turn serve about 90 percent of all American high school students.

Local consortia, and sometimes schools within consortia, have pursued diverse implementation strategies. They emphasize and combine the individual elements of Tech-Prep in varying degrees, resulting in three main forms of Tech-Prep:

- ***Structured, Comprehensive Programs of Study.*** Some consortia and schools have created structured, career-focused programs with the following features:

  - Students follow a defined sequence of integrated vocational/technical and academic courses in high school, explicitly promoted as preparation for a more specialized program or set of programs in community college.

  - The career focus in high school is often broadly defined, such as "Engineering Technology" or "Environmental Technology."

  - To maximize coherence and career focus, most programs group students together for a vocational class and at least one key academic class (such as mathematics).

  Only about 10 percent of consortia follow this approach so far. One reason is that students, parents, and even some teachers often undervalue these programs because they do not require students to attend a four-year college, which many still consider essential to career success. Scheduling constraints can also be an obstacle, making it difficult to cluster students for academic classes related to their vocational program. Only a few states have pressed local consortia to focus on this approach. However, the increasing popularity of high school career academy programs, which also group students together for key classes, suggests such scheduling difficulties can be surmounted.

- ***Enhancing Vocational Programs.*** The most common strategy, found in about 50 percent of all Tech-Prep initiatives, has the following features:

  - It also focuses on vocational students, but mostly by encouraging them to take newly developed math, science, or English classes that incorporate more applied instructional approaches.

  - Consortia train selected teachers in applied academic instructional approaches.

  - Guidance counselors are encouraged to advise vocational students to choose the applied academic classes.

  When this approach is followed, students generally do not perceive they are choosing a Tech-Prep program or identify themselves as participants in a program that leads to particular advanced programs at the community college level. No effort is made to group students together by career interest in high school, except in their vocational class.

- ***Emphasis on Articulation or Applied Academics, with No Target Group.*** In the third form of implementation, found in about 40 percent of consortia, the apparent aim is to advance just one ingredient of Tech-Prep (such as developing new articulation agreements or promoting more applied academic instruction among teachers in general). No attempt is made to create a comprehensive program experience for students with identified career interests.

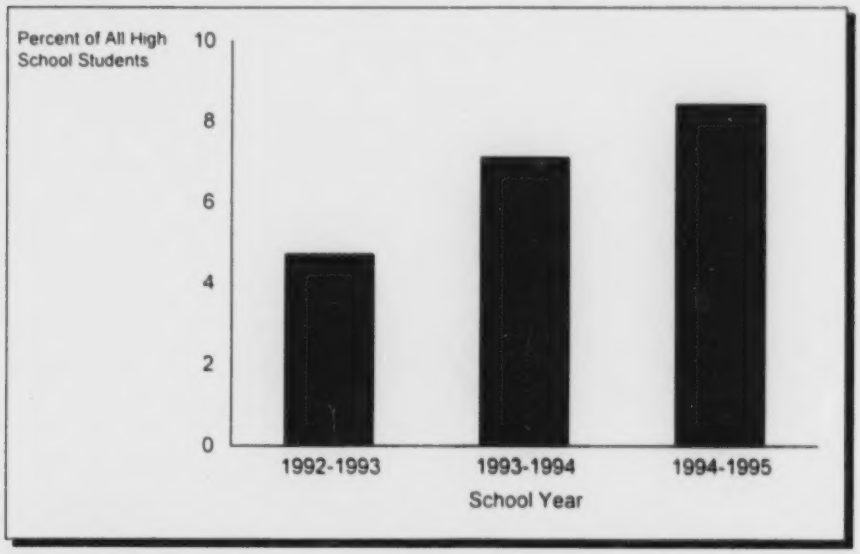
STUDENT PARTICIPATION AND POSTSECONDARY PATHS

Implementation approaches vary, but overall reported participation in Tech-Prep has grown substantially. From school year 1992-1993 to school year 1994-1995, the number of students identified as Tech-Prep participants grew substantially, from about 173,000 students to more than 737,000. This growth occurred because (1) more consortia were formed and more schools became consortium members, (2) existing consortia expanded participation from year to year, and (3) consortia improved their ability to report on participation.

These participation levels, which include all forms of Tech-Prep, are still modest compared to the overall size of vocational education and the "middle majority" of students whose educational paths inspired interest in Tech-Prep in the 1980s. Even with the substantial growth over the years of the consortium surveys, by fall 1995, at most 8.4 percent of high school students were reported by local consortia as participating in Tech-Prep as they defined it (Figure 1).

FIGURE 1

THE GROWTH OF TECH-PREP PARTICIPATION: TECH-PREP STUDENTS AS A PERCENT OF ALL HIGH SCHOOL STUDENTS



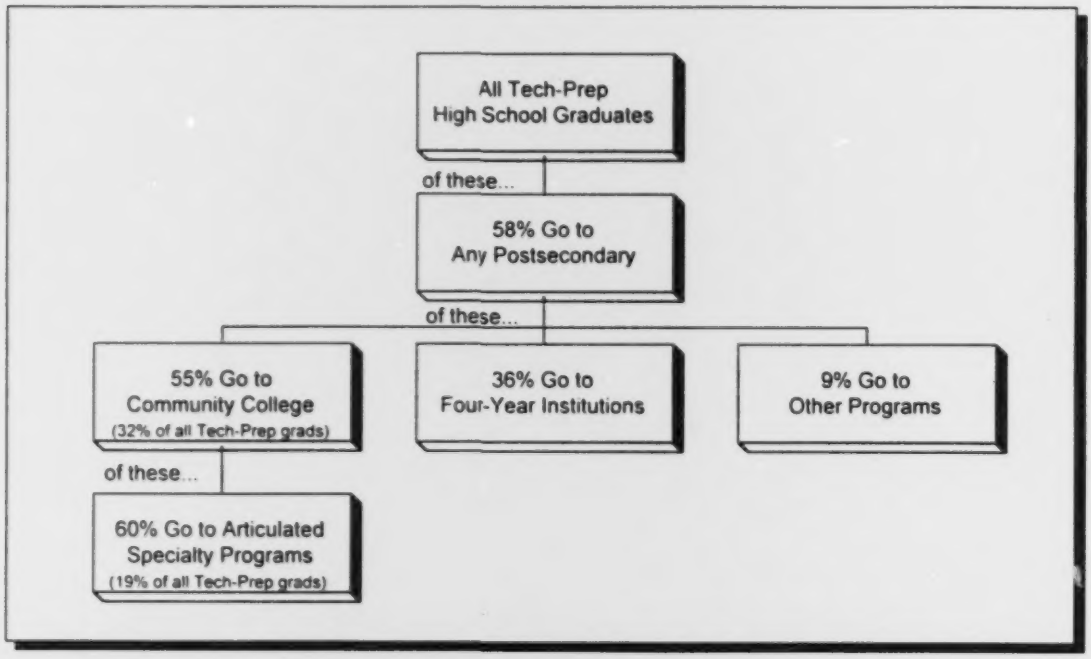
SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1993, 1994, and 1995.

Because of the various implementation approaches, "participating" in Tech-Prep means quite different things in different places. In the more common implementation models, participation can mean simply taking a single applied academic course or participating in an articulated vocational course; students often have little sense of involvement in an experience that differs from the traditional school program. We estimate that fewer than one percent of high school students are involved in Tech-Prep as a comprehensive, structured program of study.

Many Tech-Prep participants go on to postsecondary education, following paths about as diverse as those taken by students in general. Survey data from local consortia suggest that about 58 percent of students identified as "in Tech-Prep" at least start some kind of postsecondary education or training (Figure 2). The majority of them, about a third of all Tech-Prep high school graduates, enter community colleges. About 60 percent of these Tech-Prep community college students enter articulated programs; they represent only 19 percent of all Tech-Prep high school graduates. Thus the "2+2" path anticipated as the Tech-Prep sequence is not very commonly followed, largely because the ways in which Tech-Prep is implemented and students are identified as participants do not often stress that particular path over others.

FIGURE 2

TECH-PREP STUDENTS' TRANSITIONS TO POSTSECONDARY EDUCATION AND TRAINING



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

TECH-PREP ACHIEVEMENTS AND REMAINING CHALLENGES

The creation of local consortia and their implementation efforts have yielded four important benefits in many communities:

- ***Opened New Lines of Communication and Cooperation.*** Tech-Prep has helped to reduce the professional isolation of teachers, increase opportunities for professional growth, and provide channels for exchange of information on successful practices. Consortia have promoted collaboration in curriculum development and coordinated the articulation process.

- ***Mobilized Interest in Curriculum Change and Innovation.*** Tech-Prep resources have stimulated and coordinated efforts to make academic classes focus more on problem solving, application of theoretical concepts, and examples and exercises drawn from real career contexts.

- ***Stimulated Greater Employer Contact with Schools.*** In many communities, Tech-Prep has been a catalyst for getting employers more involved in school activities: working with school staff, developing technical curricula, promoting Tech-Prep to students and parents, and providing opportunities for some Tech-Prep students to visit workplaces.

- ***Focused Attention on the Need to Strengthen Math and Science Skills Among Vocational Students.*** Tech-Prep has increased awareness of the importance of math and science competencies for vocational students, many of whom in the past might have taken the minimum required in these subjects. As part of their Tech-Prep initiative, many schools encourage vocational students to enroll in applied math and science courses, which many educators view as better at imparting skills than the more traditional courses that focus on abstract theory.

These achievements are the result of efforts (in varying degrees across consortia) in three main areas: career guidance, curriculum improvement, and articulation.[1] Consortia have laid important groundwork, but more could be done in each of these areas.

Tech-Prep has helped stimulate interest in career guidance, although not in all schools. Tech-Prep legislation encourages "preparatory services" to help students learn about their interests and careers and choose Tech-Prep programs and other courses. Tech-Prep resources have helped

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[1]Many consortia have also incorporated workplace activities (such as internships) in their Tech-Prep programs for at least some students. Although workplace experiences were not explicitly called for in the Tech-Prep model or legislation, some consortia have emphasized them as they combine the goals of Tech-Prep with those of the School-to-Work Opportunities Act of 1994, which stressed workplace activity as a core element.

promote awareness of career options, foster students' interest in technology, and encourage planning for further education and careers. Most schools that offer career development activities do so for all or most students, rather than for a particular group identified as Tech-Prep participants. Schools increasingly use career exploration software, classes on career options, employer presentations in school, workplace visits, and job shadowing; in addition, many schools are installing career resource centers. There is no reason to expect all schools to offer the same career development activities, but most of these activities could still be made more available. Although 85 to 100 percent of consortia offer each of these career development opportunities in at least some schools, only 25 to 50 percent of consortia offer any of them in all of their schools.

Academic curriculum is becoming more applied, but the process is gradual. In almost every consortium, at least some high schools are working to bring more hands-on activity into math and science classes, draw on careers for classroom exercises, and promote teamwork in the classroom. Most schools at first purchased off-the-shelf curriculum packages, but many have found them difficult to use. They are turning increasingly to developing their own curricula or adopting recently published textbooks that incorporate more applied exercises than earlier textbooks did. Making classes more applied is not a simple or quick process; brief professional development workshops cannot be expected to change teachers' instructional approaches dramatically overnight. More can be done to promote applied approaches, which often are adopted by only a few teachers in a school.

Articulation is widespread, but few students take advantage of it. Tech-Prep has supported a major expansion in articulation agreements--an element emphasized in the legislation. Before Tech-Prep, at least some agreements had been adopted by schools in 51 percent of today's local consortia; by 1995, articulation agreements were in place in 96 percent of all consortia. Most agreements focus on defining the conditions under which students can receive credit in college for particular (usually vocational) courses taken in high school. We estimate, however, that only about 15 percent of students identified as Tech-Prep participants actually receive articulated credit, because of four factors: (1) lack of systematic promotion to students; (2) procedural hurdles at the college level before credits earned can be awarded; (3) diversity of Tech-Prep students' career interests and educational aspirations; and (4) the relatively diffuse and unstructured form in which Tech-Prep is usually implemented, which makes it hard to emphasize the envisioned seamless transition.

WAYS TO STRENGTHEN TECH-PREP FOR THE FUTURE

No single Tech-Prep model is likely to become universal, but the form that stresses structured programs of study holds the most promise. Not all consortia or districts will follow this approach; local control over education and the diversity of challenges school districts face make this very unlikely. However, field observation of Tech-Prep programs of all types, combined with other evaluation data, leads us to conclude that the promise of Tech-Prep can be more fully realized if federal and state leadership emphasizes the benefits of structured programs of study.

Tech-Prep as a structured program of study appears more likely to improve student outcomes than other approaches that emphasize individual elements of Tech-Prep in isolation. The evaluation was not intended or designed to generate rigorous statistical evidence, but there are two reasons for this conclusion, based on field observation. First, by implementing individual, often unconnected,

elements of Tech-Prep rather than the more fully defined and structured programs of study, most consortia have sacrificed what distinguishes Tech-Prep from other educational strategies--the *combination* of elements in a program experience for particular students. Most consortia have developed these elements--applied academic classes, career guidance, and articulation options--as separate initiatives, without ensuring that individual students experience their combined effects in a career-focused program of study.

The second reason is that the structured program form of Tech-Prep is more likely to promote transition to advanced preparation at the postsecondary level. Local consortia have given lower priority than early proponents of Tech-Prep envisioned to students' postsecondary transition. Where we have observed career-focused programs of study with close articulation to a related college program, high school students enter Tech-Prep with greater expectation of continuing to its college stage, and high school and college faculty continually remind them of that path. In Tech-Prep initiatives without structured programs of study, Tech-Prep students are a diverse group with varied career interests and educational aspirations, often identified as participants only because they took an applied math or science class. As a result, many consortia have found it inappropriate to stress the continuity between Tech-Prep in high school and particular college programs. Instead, they promote educational and career planning in general, encouraging all students to prepare for college of some kind. Thus, Tech-Prep in its common forms is unlikely to do more than traditional guidance counseling or vocational education to strengthen students' career direction and propensity to follow a postsecondary career preparation path that builds on what they learned in high school.

Tech-Prep has made important contributions. However, four steps could be taken to realize more completely its goals as a distinct federal initiative and separate funding vehicle:

Strengthen Emphasis on Programs of Study to Make Tech-Prep a More Powerful Experience

Given the finding that the structured program of study model for Tech-Prep is most promising, the U.S. Department of Education could more clearly support it as the favored form of implementation. State agencies could be encouraged to make consortium funding more dependent on efforts to follow this implementation approach, even if it means that the formally reported level of Tech-Prep participation declines. Small schools with limited options for creating distinct programs of study may face special challenges, and the political nature of funding allocation is likely to preclude uniform insistence on structured programs of study. However, efforts should be made to increase the proportion of Tech-Prep resources devoted to this form of Tech-Prep.

This suggestion is not intended to deny the potential value of particular elements of Tech-Prep in isolation from the more comprehensive implementation approach. However, narrower efforts to promote individual Tech-Prep elements, such as applied academic instruction or better career guidance, should rely on other funding sources, for two reasons. First, efforts to promote elements such as applied instruction or career guidance for the general student population are likely to attract the support and enthusiasm of a wider range of teachers and counselors if leadership comes from agencies and groups not associated with vocational education, as Tech-Prep usually is. Second, concentrating the relatively modest level of Tech-Prep resources on developing structured programs

of study is a more certain way to create the kinds of coordinated activities that can substantially change at least some students' educational experiences.

Focus on Preparatory Services Central to the Tech-Prep Model

Tech-Prep resources, instead of being used broadly to develop general career guidance capacity, should focus on promoting student participation and success in Tech-Prep. If Tech-Prep implementation concentrates more on developing and expanding the structured program of study form of Tech-Prep, more attention will have to be paid to preparatory services that directly reinforce and support these programs of study. Efforts should focus on getting students interested in Tech-Prep, preparing them for Tech-Prep programs, and helping them stay in the program and move on to the postsecondary stage.

Discourage Funding of Small, Very Localized Consortia

States should be encouraged to promote one of Tech-Prep's major contributions--consortia that perform functions that individual schools and small districts cannot or would not on their own. These consortia strengthen communication among educators and provide opportunities for professional development that take advantage of economies of scale. In states that simply divide Tech-Prep funds among small, single-district consortia, these advantages are not achieved.

Promote Programs of Study for Whole-School Change, but Not as the Sole Focus of Tech-Prep

Wide interest among educators and policymakers has emerged in promoting Tech-Prep as school reform; this interpretation of the aims of Tech-Prep should be pursued cautiously, however. At the federal, state, and local levels, many educators involved in Tech-Prep implementation now consider certain elements of Tech-Prep to be beneficial to all students, not just to students who might in the past have been in a vocational or general education track. However, we have found that, where Tech-Prep is promoted as "for all students," local consortia are unlikely to emphasize the creation of comprehensive career-focused programs of study. Instead, efforts are made to introduce applied academic or contextual learning strategies through professional development activities that are often not deep enough to change classroom practices substantially and that therefore change students' experiences only marginally.

However, career-focused programs of study can be useful for a wide range of students. Entire schools can be organized around broad career themes, where students and parents are convinced that doing so is useful. Interest in extending the benefits of Tech-Prep ideas to all students, however, should not outweigh the importance at the federal and state levels of insisting that Tech-Prep be meaningful for those who participate. We recommend persistence in developing Tech-Prep programs of study as an option for some students in most schools, to maximize chances of strengthening their success in school and their sense of career direction for the future. In those communities that embrace the value of organizing education around broadly defined career areas, the program of study model can become a foundation for changes that affect all students.

I. INTRODUCTION

Federal legislation and funding for Tech-Prep programs have stimulated efforts to remedy widely perceived shortcomings in American education. Workplaces of today commonly require the use of sophisticated technology and the ability to learn new skills and adapt to continuing change. Many American students, however, fail to develop these skills in high school; they either go no further in their education or go on to further education but must devote much of their time to mastering basic academic skills instead of developing advanced academic, technical, and problem-solving skills. Often, students graduate from high school (and even postsecondary programs) without having developed a career goal or a set of skills they can build on to develop a career. Traditionally, the programs students follow in high school are affected little by consideration of the careers to which their education might lead.

The Tech-Prep Education Act of 1990 addressed these concerns. The act was incorporated by amendment as Title IIIE of the Carl D. Perkins Vocational Education Act of 1984. The legislation authorized federal funding, through the states, to local consortia of public schools and postsecondary institutions, as a way of strengthening the educational programs offered to youth who might not earn four-year college degrees. The law also mandated an evaluation of Tech-Prep programs. This report provides final results of that evaluation, which has been conducted under contract to the U.S. Department of Education by Mathematica Policy Research, Inc., with assistance from Northwest Regional Educational Laboratory.[1]

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[1]Earlier publications issued as part of the evaluation are listed at the end of this report.

The major findings and conclusions of the evaluation concerning Tech-Prep implementation are summarized in Table I.1. These results are derived from analysis of five broad questions, which we address in Chapters II through VI of this report:

- How have states shaped and furthered the objectives of the Tech-Prep legislation? (Chapter II)
- What are the major elements of Tech-Prep, and how have they been implemented? (Chapter III)
- How have local consortia interpreted the Tech-Prep concept and emphasized the various elements in their local implementation efforts? (Chapter IV)
- Who has participated in Tech-Prep in high school? (Chapter V)
- What happens to Tech-Prep participants after high school? (Chapter VI)

Chapter VII draws together the main themes of the evaluation. It summarizes the major accomplishments of the Tech-Prep movement, identifies important issues still to be resolved, and offers suggestions for addressing these issues.

This introductory chapter provides basic background for the report findings. In Section A, we review the specific concerns addressed by the Tech-Prep Education Act. Section B summarizes the major features of the Tech-Prep model as envisioned in the federal legislation. Section C describes the evaluation that has been conducted and the sources of data drawn on in the following chapters of the report.

A. WHY WAS THE TECH-PREP EDUCATION ACT PASSED?

The Tech-Prep Education Act is a response to three broad and interrelated concerns. First, it promotes a way to improve the preparation of students for promising careers. Second, it addresses concerns about the quality of both academic and vocational education and seeks to enhance their

TABLE I.1

MAIN RESULTS OF THE NATIONAL TECH-PREP EVALUATION

1. ***Tech-Prep concepts have been widely introduced throughout the country.*** By 1995, states had created more than 1,000 local consortia, which encompassed 70 percent of all school districts. Tech-Prep consortia have strengthened collaboration between high schools and community colleges. They have brought academic and vocational teachers together to learn new instructional strategies, develop curricula, and share promising practices. In many communities, Tech-Prep has increased employer involvement with schools. However, only eight percent of high school students are involved in what consortia call Tech-Prep.

2. ***Progress has been made in implementing individual elements of Tech-Prep.*** The number of secondary-postsecondary articulation agreements has increased, particularly for vocational courses, encompassing new occupational areas. However, few students take advantage of articulation. Almost all consortia strive to make academic classes more applied, but not all schools are involved. Increasingly, schools are turning away from off-the-shelf curriculum packages and, instead, developing their own materials. Many consortia and schools focus mostly on strengthening career development, with activities to increase career awareness, promote interest in technology, and stress educational and career planning. This approach is often favored because it can include all students and, thus, avoids giving the impression that Tech-Prep is a form of tracking.

3. ***Tech-Prep is implemented in diverse ways, but rarely as a comprehensive, structured program of study.*** Elements of Tech-Prep are rarely combined for individual students in a defined program that they consciously choose, and that emphasizes a career focus, links academic and technical content, and stresses continuation to a postsecondary stage of specialized studies in a related career area. Only about 10 percent of consortia implement Tech-Prep in that form. About half of all consortia instead aim primarily to have guidance counselors encourage vocational students to take applied academic classes. Roughly 40 percent of consortia simply make applied academic classes, articulation, or career guidance available to students in general, and avoid focusing on any particular group of students. Our assessment is that the promise of Tech-Prep could be achieved more fully if greater emphasis were placed on the more structured--but currently least common--program approach.

4. ***Postsecondary transition could be promoted more effectively in the context of more focused programs of study.*** Despite the Tech-Prep goal of creating a "seamless" link to college, most current implementation strategies are likely to have limited effect on students' choices of postsecondary paths. Most articulation links specific courses rather than linking students' overall high school programs to particular college programs, and few schools systematically promote articulation to students. Since structured, career-focused programs of study are uncommon, participation in what is called Tech-Prep rarely requires students to focus on a career preparation path in high school that includes a related college program. As a result, many consortia focus on promoting postsecondary education in general, rather than on encouraging the kind of continuity between high school and college that has long been highlighted as a key feature of Tech-Prep.

effectiveness in preparing students for careers by integrating them more closely. Third, Tech-Prep was conceived to improve education for a historically neglected segment of the American student population: those in the middle quartiles of academic achievement who are likely to finish high school but who are unlikely to attend or complete a four-year postsecondary education program.

1. Need for Postsecondary Career Preparation

When the Tech-Prep legislation passed, the American economy was undergoing changes (still observed today) that have generally raised expectations of the workforce. The level of education and basic skills necessary to land a well-paying job has been increasing in a wide range of occupations (Levin and Rumberger 1989). The availability of jobs in manufacturing and other industries with low skill requirements continues to decline; as a result, between 1979 and 1993, the real income of a 30-year-old man with only a high school diploma declined by 28 percent (Murnane and Levy 1996). Employers commonly claim that young people lack the social and basic skills needed even for entry-level jobs in modern workplaces. At the same time, the demand for well-qualified employees grows. Labor force projections in the early 1990s suggested that much of the increased demand would be in "middle-range" occupations--jobs that require one or two years of education and specialized training beyond high school--in fields such as nursing, computer science, law enforcement, office machine service and repair, banking, and insurance (Parnell 1991). The Tech-Prep legislation was in large part motivated by the perception that an education ending in high school is a poor basis for a career and that postsecondary education of some kind is important for almost all youth.[2]

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[2]Today, according to Murnane and Levy, it is not only postsecondary education that is important to a successful career, but also mastery in high school of the "new basic skills": hard skills (such as mathematics and reading), soft skills (such as oral presentation and group teamwork), and (continued...)

2. Gap Between Academic and Vocational Education

Early advocates of Tech-Prep argued that preparing youth for successful careers requires integrating academic and vocational education, which have traditionally operated as separate tracks in American schools. Academic curricula have long been criticized for failing to provide participatory learning that helps students connect what they learn to the "real world" in which skills are used (Grubb et al. 1991). Vocational programs also have been criticized, sometimes for continuing to focus on outdated technical skills, but also for giving scant attention to the communication, mathematics, and reasoning skills that are increasingly important to success in employment. In the 1980s, studies found that secondary vocational education was not meeting the needs of students or employers (Committee for Economic Development 1985) and that fewer than 3 of every 10 graduates of vocational programs worked at jobs using skills they learned in school (Lerman and Pouncy 1990).

The solution Tech-Prep advocates proposed to this problem was to link academic and vocational learning more closely in integrated programs of study organized around a career focus. Academic instruction would become more applied, using students' career interest as a source of examples and exercises to make mathematics, science, and English less abstract and more relevant to the work they might do in the future. These changes in teaching methodology were expected to engage students' interest in academic material more than traditional instructional approaches, thereby raising prospects for higher academic achievement. Occupational courses would incorporate more of the math, scientific, and communication skills students learn in their academic classes, further emphasizing these competencies.

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[2](...continued)
proficiency in using computers for simple tasks.

3. Concerns About the "Neglected Majority" of Students

In the years preceding the creation of Tech-Prep programs, concerns about the effects of economic change and the need to give students more rigorous and integrated education focused on a broad middle segment of American students. Students in the middle two quartiles of academic achievement were increasingly recognized as "the forgotten half" (William T. Grant Foundation 1988) or a "neglected majority" (Parnell 1985). High school guidance offices historically focused most of their attention and resources on helping students get into four-year colleges and gave less attention to helping other students plan for shorter-term career preparation or immediate employment. Overall spending was similarly skewed; according to one calculation, combined state, local, and federal spending on education for non-college-bound youth amounted to one-seventh of spending on college-bound youth (Educational Testing Service 1990). Only 30 percent of high school students were expected to complete a four-year college degree (William T. Grant Foundation 1988). For several decades, however, students have been led to believe that a successful career depends on that credential. Students not interested in four-year college were increasingly viewing their performance in high school--including vocational programs--as irrelevant to future job prospects.

The challenge was how, for this middle group of students, to do the following:

- Make high school studies a more coherent foundation for subsequent education or employment
- Introduce higher standards in both academic and vocational courses
- Increase motivation to pursue higher education they would most likely need for career success
- Encourage choice of postsecondary programs that would prepare them for careers with growing labor demand, attractive potential earnings, and career growth prospects

B. THE TECH-PREP MODEL AS CONCEIVED IN FEDERAL LEGISLATION

Much of the impetus for Tech-Prep programs came from a formulation of the idea first proposed in the 1980s by Dale Parnell (1985, 1991). Parnell's model emphasized applied learning--teaching academic materials through practical hands-on experience--and the development of clearly defined technical and academic competencies. Rather than watering down or neglecting academic content, schools are to find effective ways to teach students who learn best through tangible experience. Under Parnell's model, students would be presented with planned programs of study that combine academic and vocational courses and link their high school classes to advanced technical education in community colleges, technical colleges, apprenticeship programs, or other postsecondary institutions. This model was proposed--and seen as most critically needed--to prepare students for careers in which technical skills play an important role.

Title IIIE of the Perkins Act incorporated specific elements of Parnell's model, although it did not specify how they should fit together as a program. The legislation listed seven elements required of local programs to be eligible for federal Tech-Prep funding:

1. ***Articulation agreements*** between secondary and postsecondary institutions participating in Tech-Prep consortia, to establish a framework for creating "seamless" programs spanning secondary and postsecondary stages

2. ***A 2 + 2 design***, in which a common core of math, science, communications, and technology is defined for the last two years of high school, as a basis for two years of more advanced and specialized courses at the postsecondary level[3]

3. ***A Tech-Prep curriculum*** appropriate to the needs of each secondary and postsecondary institution, so that the overall program design makes full use of each school's resources but also takes into account the needs of its student body

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[3]Amendments in 1994 allowed Tech-Prep resources to be used for activities affecting students in grades 9 and 10 as well.

4. ***Joint staff development*** for secondary and postsecondary faculty, to promote cooperation and common understanding of objectives, overcome turf jealousies, and maximize the continuity of curriculum over the four-year program

5. ***Training for school counselors***, to promote effective student recruiting, retention, and placement, including staff at the secondary and postsecondary levels

6. ***Measures to ensure access*** for special populations such as students with disabilities, disadvantaged students, and students with limited English proficiency

7. ***Preparatory services***, such as recruiting, counseling, and assessment, to help students understand the Tech-Prep option and make decisions concerning program and course selection and later career goals

By not specifying how various elements of Tech-Prep should be emphasized and connected for individual students, the legislation left it to states, local consortia, and schools to decide what the "programs" called for in the legislation should be. From the perspective of educators, a "program" might be considered in place if its various elements are broadly available, even if particular students are affected by only some of them and no identifiable group experiences all of the features that educators consider the elements of Tech-Prep. Others, however, might stress the student perspective; they might argue that, from the standpoint of students, a "program" becomes meaningful when it is a package of elements that together constitute a substantial departure from the educational experiences students would otherwise have. A clear preference for one or the other interpretation of "program" was not stated in the legislation, but this distinction has turned out in the evaluation to be an important basis for differentiating among forms of Tech-Prep implementation.

Title IIIE authorized federal spending for local consortia whose initiatives included the key elements in some way. Federal funds are distributed to states, which then award grants to plan and operate Tech-Prep programs to consortia of local secondary educational agencies and postsecondary institutions. A total of approximately $568.3 million has been appropriated and allotted for state and

local consortium use in program years 1991-1992 through 1996-1997, an average of about $95 million a year.

C. EVALUATION DESIGN

To chart the progress and accomplishments of the Tech-Prep program, the U.S. Department of Education contracted with Mathematica Policy Research, Inc., for a five-year national evaluation of Tech-Prep. The evaluation had two main objectives. First, it was designed to describe how effectively Tech-Prep was implemented--documenting the number and characteristics of local consortia, the institutions involved, the populations served, and the nature of the planning and implementation process. Second, the evaluation has aimed to identify effective implementation practices and the challenges encountered in implementing the program. The evaluation had three major components:

1. ***A survey of state-level Tech-Prep coordinators***, conducted in fall 1993 and spring 1997
2. ***A survey of local Tech-Prep consortia***, conducted in fall 1993, 1994, and 1995[4]
3. ***In-depth studies of 10 local consortia,*** including four rounds of annual site visits and a follow-up study of a sample of students in selected member high schools[5]

The longitudinal survey of local consortia provides the most representative and complete information available on Tech-Prep throughout the nation. Every local consortium coordinator was

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[4]The original evaluation design called for a fourth survey in 1996, but that survey was dropped because of concerns that a comparable survey of local School-to-Work partnerships would impose excessive burden on schools involved in both Tech-Prep and School to Work.

[5]The 10 in-depth study sites include consortia based in the following locations: Dayton, Ohio; Dothan, Alabama; East Peoria, Illinois; Fresno, California; Gainesville, Florida; Hartford, Connecticut; Logan, West Virginia; Salem, Oregon; Springdale, Arkansas; and Springfield, Massachusetts.

included in the surveys--812 in 1993, 953 in 1994, and 1,029 in 1995. High completion rates were achieved--86, 91, and 87 percent, respectively, in the three years of the survey. Local coordinators assembled information about their consortium by contacting the individual member schools.

The in-depth studies provided important insights into the details of how Tech-Prep is implemented, but the data from these sites are not representative in any statistical sense of Tech-Prep consortia in general. The 10 in-depth study consortia were selected in fall 1992, based on nominations from state Tech-Prep coordinators and other researchers and practitioners, as consortia that were making outstanding progress in defining and implementing their local programs. Visits were made to many of the schools in these consortia; these visits included interviews with faculty, counselors, administrators, and collaborating employers, as well as focus groups with students. The student follow-up study was conducted in selected schools in these consortia, where Tech-Prep was defined enough in fall 1993 to identify a group of Tech-Prep participants. High school juniors identified as Tech-Prep participants in fall 1993 were interviewed in early 1997, approximately 18 months after they should have graduated from high school. High school transcripts were also collected for these students.

Both the student survey and transcript data, however, have been used with great caution. The survey was completed by just 61 percent of the sample of 799 students, because many were difficult to locate. Moreover, transcripts provided an incomplete picture of student performance and outcomes. In several schools, as many as 25 to 50 percent of students had incomplete transcripts because they had left the school, and the schools could not distinguish between students who had dropped out of school and those who had transferred to another school. Despite these shortcomings, the survey and transcript data provide indicators of student activity in Tech-Prep that are useful complements to the information collected in site visits and to the national surveys of all consortia.

This diverse set of data provides the foundation for our assessment of national Tech-Prep implementation. The aim of this report is to assess how effectively the Tech-Prep concept has been translated into operational programs. Although the evaluation was not designed to yield rigorous estimates of Tech-Prep's impact on student outcomes, the assessment of implementation effectiveness provides important guidance about which implementation approaches have the most promise in the long term to advance the ultimate goals of Tech-Prep: to strengthen students' skills for a rewarding career by improving their achievement in high school and in further education.

II. STATE AND LOCAL INFRASTRUCTURE FOR TECH-PREP

The development of Tech-Prep programs is intended to be a collaborative effort. Congress specified that Tech-Prep funding should go to consortia of local education agencies and postsecondary institutions that offer two-year degrees. The legislation has encouraged schools and community colleges to work together to create "seamless" programs spanning the two educational levels. Congress also made state education agencies partners in the effort, by giving them responsibility for awarding grants to local consortia.

These local consortia and state agencies form an infrastructure for the implementation of Tech-Prep. Together, they distribute federal funds, define programs, develop curricula, create opportunities to share expertise, and monitor progress. In this chapter, we describe the main features and functions of this infrastructure. Four salient findings emerged from this examination.

KEY FINDINGS ABOUT STATE AND LOCAL TECH-PREP INFRASTRUCTURE

States support local consortia but allow considerable latitude in defining Tech-Prep. State efforts focus on technical assistance through conferences and, sometimes, curriculum tools. States have defined aspects of Tech-Prep, but these definitions serve as general guidelines rather than prescriptions. The discretion that states allow local consortia parallels the nonprescriptive federal stance about how Tech-Prep should be implemented.

At the state level, Tech-Prep typically operates somewhat independently of broader education and workforce development reforms. Tech-Prep was defined as an education program, and most states structure leadership accordingly, involving only education agencies in governance. Only about a fifth of states formally integrate Tech-Prep and school-to-work (STW) governance.

States have created a far-reaching infrastructure of local consortia. By fall 1995, there were 1,029 local consortia, including as members 70 percent of all local school districts. These districts serve 88 percent of all U.S. high school students. Great variation exists, however, in the extent to which schools take part in Tech-Prep.

Local consortia play useful roles in Tech-Prep that member schools alone might not undertake. Where consortia include multiple school districts, their main roles are organizing professional development activities for local school staff, coordinating the articulation process, and, sometimes, helping to pay for local computers and curriculum materials.

A. STATE ROLES IN GUIDING AND PROMOTING TECH-PREP

Federal Tech-Prep legislation gives states broad latitude in defining the role they play in guiding local implementation. Title IIIE of the Perkins Act specifies that states should distribute federal funding through grants to local consortia that conform to Title IIIE definitions and operate programs that incorporate the main Tech-Prep elements identified in the Act. States are required to give special consideration to consortia whose plans provide for particular consortium or program features.[1] General Perkins Act provisions specify that states shall develop a plan for vocational education, monitor program effectiveness, provide technical assistance, and assure compliance with applicable federal laws. However, from the Title IIIE legislative language itself and subsequent federal guidance, it is possible to infer broad areas of discretion concerning how Tech-Prep programs could be implemented. Circumstances in each state, relating to the historical allocation of control over education and the direction of other education initiatives, have created additional reasons for states to follow their own lead in defining implementation approaches. Instead of interpreting the program elements required under Title IIIE as a model for the Tech-Prep program that all participating student should experience, most states have interpreted them as guidance on what program inputs or ingredients consortia should develop and make available. States in turn have worked to shape local Tech-Prep implementation, and two fairly consistent patterns have emerged in the role they have played:

- States have given local consortia considerable latitude in defining what Tech-Prep is, just as states have, in effect, been given that latitude from the federal level.

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[1]Special consideration in funding decisions is required in Section 345 for consortia that plan employment placement or transfers from two-year to four-year postsecondary programs, programs that are developed in consultation with business, industry, and labor unions, and programs that address dropout prevention goals and needs of minority youth, limited English proficiency students, youths with disabilities, and disadvantaged youth.

- Tech-Prep has remained an educational program, with varying degrees of policy and governance linkages to other education or workforce development efforts.

1. Most States Have Played Supportive, Rather than Prescriptive, Roles in Tech-Prep

In general, states are promoting local development of Tech-Prep but avoiding rigid enforcement of a particular conception of Tech-Prep. In most cases, state Tech-Prep staff have provided technical assistance and resources for local implementation and have not tried to dictate in detail how local consortia should implement the program. In some states, this approach is partly a result of a tradition of local school control that makes it difficult for state agencies to prescribe a specific model for Tech-Prep implementation at the local level.

a. State Definitions Generally Are Flexible Guidelines

Most state coordinators say their agency has defined at least some feature of local Tech-Prep programs (Table II.1). In particular, states have increasingly tried to define what specific experiences or activities distinguish a Tech-Prep student from other students. In 1993, 27 states reported they had issued a definition of what it means to participate in Tech-Prep, and 18 of those said that local consortia were required to use the definition in reporting on their programs. By 1995, 40 states said they had issued such definitions, and 35 of those said local consortia were required to use them.

For various reasons, however, state definitions of what Tech-Prep should consist of at the local level are usually, in effect, guidelines. Even when state agencies purport to define how Tech-Prep should be implemented, some may be inadequately communicating policies to local consortia or be choosing not to insist on compliance with what are ostensibly issued as state requirements. For example, only 21 percent of consortia reported in 1995 that their state Tech-Prep office provided a

TABLE II.1

TECH-PREP FEATURES PRESCRIBED FOR LOCAL CONSORTIA BY STATE AGENCIES
(Number of States)

Prescribed Feature	At the Secondary Level	At the Postsecondary Level
Target Population	31	24
Features of Articulation Agreements	31	32
Types of Postsecondary Institutions	n.a.	20
Credential/Degree Objectives	26	24
Approaches to Skill Certification	16	11
Curriculum Development Objectives	25	20
Development/Adoption of Occupational Skills Standards	19	19
Type and/or Amount of Staff Training	20	16
Approaches to Career Guidance	26	20
Methods to Facilitate Access for Special Populations	18	17
Definition of Student Participation	35	28
Grade when Students Choose Career Clusters	21	12
Requirements for a Database/Tracking System	21	18
Criteria for Assessing Program Performance	25	24
Involvement of Program-Level Business Advisory Groups	25	23
Inclusion of Work-Based Learning Components	29	26

SOURCE: Inventory of State-Level Tech-Prep Activities, spring 1997.

n.a. = not applicable.

definition of what the core Tech-Prep program should be.[2] Moreover, although most states claim to define what it means to participate in Tech-Prep, at least half of all local consortia in those states operate with different definitions.[3]

When states define elements of Tech-Prep for local consortia, moreover, they often do so in broad terms that give little operational guidance. For example, definitions of Tech-Prep sometimes refer not only to activities students should engage in during their high school years, but also to desired eventual outcomes--such as "successfully completes a related associate's degree program." Although such provisions clarify the state's goals for Tech-Prep students, they leave to local consortia the responsibility for determining what features of the program are needed to achieve the goal. Similarly, some states specify that Tech-Prep students must "choose a career focus" but leave it to local consortia to determine how and if that choice will affect the students' course selection. The result is that local consortia in most states have had wide latitude in interpreting what Tech-Prep is and how it should be implemented.

A few states, however, do take conscious steps to shape local Tech-Prep programs, mostly through their process for funding local consortia. West Virginia, for example, chose to fund only Tech-Prep programs that conformed closely to a state model and that focused on specific technical careers that the state believed were important to local economic growth. Ohio has concentrated its Tech-Prep funding in area vocational centers and provided strong guidance to ensure that local consortia adhere to a particular model of Tech-Prep. Although such examples have been the

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[2]In only five states (Arkansas, Idaho, Louisiana, Rhode Island, South Carolina) and Puerto Rico did more than three-quarters of local consortia say their state agency had mandated a definition of a core Tech-Prep program at the high school level.

[3]Chapter V contains a discussion of the many ways in which Tech-Prep participation is defined and the broad models in which these definitions can be grouped.

exception, they demonstrate that firm insistence on the use of Tech-Prep resources to create a particular type of program is possible. Doing so, however, requires that states be more specific about details of program implementation than the language of the federal legislation.

b. States Focus on Developing Tools That Will Help Local Implementation

Instead of prescribing program details, most states have focused on helping local consortia understand Tech-Prep concepts, develop and realize their own plans, and use tools that the state can provide. State efforts to support Tech-Prep implementation focus on three areas: (1) facilitating information exchange through conferences and workshops, (2) developing curriculum tools, and (3) promoting statewide articulation:

- ***Conferences and Workshops.*** Almost every state runs statewide conferences or workshops for Tech-Prep consortia. These conferences serve as a forum for state presentations and as an opportunity for local teachers, counselors, administrators, and coordinators to exchange ideas and information on practices or curricula they have found useful.

- ***Curriculum Tools.*** To a lesser extent, states have developed Tech-Prep materials and tools for use at the local level. By 1995, for example, 28 states were actively developing applied academic curricula that consortium schools could adopt, and 14 were developing technical curricula. Just 10 of the states reported they were involved in establishing industry skill standards that might guide curriculum revision.

- ***Statewide Articulation.*** Although articulation between secondary and postsecondary programs is largely a local process, states have contributed in two ways. Some have prepared model articulation agreements for local consortia to use. In addition, nearly two-thirds of the states have developed or are developing statewide agreements that allow articulation credits awarded by one community college to be transferred to other community colleges in the state. Some agreements also provide for transfer of credit from community colleges to four-year state institutions.

2. Some States Are Emphasizing Integration with Other Initiatives

Because Tech-Prep was first conceived as an education program (rather than as general school reform or an integral part of a broader strategy of workforce development), federal legislation

provided that, at the state level, it would be directed by agencies responsible for vocational education. To be sure, the general Perkins Act requires that other parties, particularly private-sector employers, be included in a state council on vocational education. However, little priority was placed on creating formal links between Tech-Prep leadership and other state agencies, nongovernmental parties, or even other school reform initiatives. This conception of Tech-Prep stands in contrast to the later School-to-Work Opportunities Act of 1994 (STWOA), which called for broad partnerships at the state and local level.[4]

Reasons have emerged, however, for states to coordinate their guidance of Tech-Prep with other initiatives. Tech-Prep's emphasis on preparing students for careers makes it a potentially important part of workforce development strategies and the agenda of emerging workforce development boards. The Tech-Prep priority of presenting vocational students with more challenging technical and academic content is consistent with the emphasis in general education reforms on raising academic standards for all students. Most obviously, reasons exist for linking responsibility for implementing Tech-Prep and the STWOA, because the two initiatives emphasize many of the same kinds of changes in schools. These two reform initiatives also imply a need for access to some of the same state resources outside education agencies (for example, information about career opportunities and the means to access that information, which often reside in state departments of employment).

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[4]In many states, the staff resources devoted to Tech-Prep at the state level are correspondingly limited. In most states, staff from agencies responsible for both secondary and postsecondary education make up a Tech-Prep team or committee, but these staff members typically have other assignments as well. In fiscal year 1996, states had an average of about 2.5 full-time equivalent staff assigned to state-level Tech-Prep functions. Almost all federal funds are passed to local consortia by the states; in fiscal year 1996, state agencies retained an average of only six percent of their Title IIIE funding for state activities.

Despite the original conception of Tech-Prep as a program rather than general school reform, efforts have been made in some states to connect it to other education initiatives. Such connections could simply guard against conflicting aims and resulting confusion, or they could help states meld initiatives conceived separately into a coherent, broad strategy for improving education. These efforts have focused most on linking Tech-Prep and STW implementation, specifically through the creation of formal policy-making bodies that encompass both. These connections are unusual, however, and Tech-Prep still is often administered strictly as an education program with limited input from outside the education agency. For example, results of the 1997 survey of state Tech-Prep coordinators show that:

- ***About a fifth of the states formally integrate Tech-Prep governance into larger policy committees.*** In 11 states, Tech-Prep is guided or coordinated by a state-level committee or board that has broader policy responsibilities or is part of a higher-level body that does.

- ***Governance links with STW have been created in about half the states.*** Among the 11 states where a Tech-Prep leadership committee or board has broader responsibilities, 10 indicate that its responsibility also includes STW implementation. In an additional 16 states, the education agency that has lead responsibility for Tech-Prep is taking a leading role in STW planning, grant roll-out to local STW partnerships, and monitoring of STW progress.[5]

- ***Formal involvement of noneducation agencies and other partners in Tech-Prep governance is more the exception than the rule.*** Multiple education agencies are often involved because of the way responsibilities for academic and vocational education, and for secondary and postsecondary education, are divided. However, in three-quarters of the states, no noneducation agencies are described as routinely involved in Tech-Prep matters. Of the 30 states that have Tech-Prep governing boards, 9 include staff from the state Department of Labor, 13 include business and industry representatives, and 4 include labor representation.

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[5]These 26 states include 21 that have federal STW implementation grants; such linkages might still be created in the other 16 states with STW grants, particularly those that have received them more recently.

Although many states are integrating staff and governance bodies that support Tech-Prep and STW implementation, some other states have created organizational divides that impede integration. Integration is particularly challenging in states where the education agency that administers Tech-Prep is not also responsible for STW implementation. In some of these states, grantee entities (Tech-Prep consortia and STW partnerships) are defined differently at the local level, and separate lines of communication from the state to local grantees have been created. In this situation, considerable energy has to be devoted at both the state and local level to reconciling diverging or apparently conflicting goals and guidance.

B. CREATION AND CHARACTERISTICS OF LOCAL CONSORTIA

The most obvious state function in Tech-Prep implementation has been the creation of a system of consortia to carry out Tech-Prep development. States have distributed Title IIIE grants to consortia since July 1991, in a few cases funding existing structures or partnerships and in others encouraging formation of new collaborative entities. In some states (such as Texas and Oregon), local responsibility for Tech-Prep was given to established groupings of secondary agencies and postsecondary institutions that administer basic vocational funding and/or other workforce development initiatives. These regional entities became local consortia. A few states (such as Kentucky and Georgia) decided to allocate Tech-Prep grants to individual school districts to work with their postsecondary partners. In other states, the number and configuration of Tech-Prep consortia were determined at the local level by the coalescence of partners rather than by state plan.

The overall state effort to create local consortia has had three important consequences:

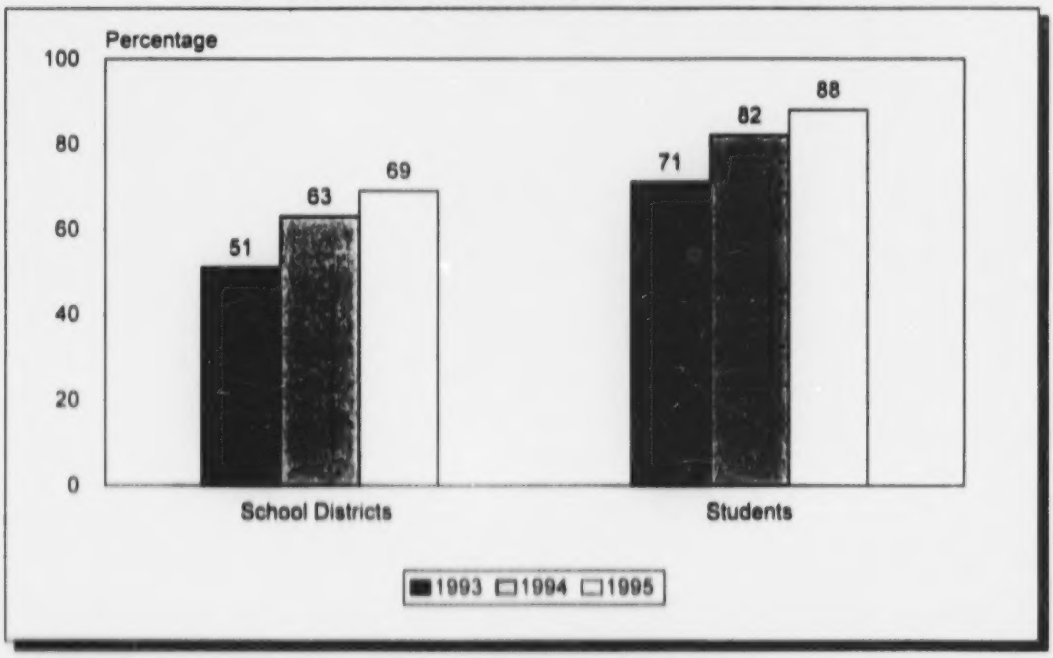
- Tech-Prep consortia now encompass most of the local American education system.
- As a result, total Tech-Prep resources provide a modest base if they are used to undertake widespread change throughout consortium schools.

- Even with modest resources, the creation of Tech-Prep has stimulated involvement of employers in local education, sometimes helping to begin the recruitment of employers for more intensive roles envisioned in the STWOA.

1. Tech-Prep Consortia Now Cover Most School Districts and Students

Tech-Prep has, to at least some degree, been introduced throughout most of the United States (Figure II.1). By fall 1995, states had awarded federally funded grants to a total of 1,029 local consortia, which included almost 70 percent of all U.S. school districts serving 88 percent of all American high school students. Evaluation surveys and site visits have made it clear, however, that great variations exist in the extent to which districts are involved in Tech-Prep, and just as much variation exists in the level of involvement of their individual schools. In some consortia, for

FIGURE II.1
PERCENTAGE OF U.S. SECONDARY DISTRICTS AND STUDENTS INCLUDED IN TECH-PREP CONSORTIA, BY SURVEY YEAR



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.
NOTE: Percentages are adjusted for response rate.

example, early implementation efforts focus on vocational centers or vocational divisions of comprehensive high schools, and only gradually do other schools and academic divisions become interested in the kinds of curriculum and instructional changes consortium leaders are promoting.

Variation in schools' involvement in Tech-Prep is not surprising, given the substantial size and complexity of many consortia (Table II.2). Small consortia are the exception; just 7 percent (63) include only a single secondary school, whereas 45 percent include more than 10 high schools. Large consortia encompassing five or more school districts and multiple postsecondary institutions account for more than 33 percent of all local consortia. The average local consortium now includes over 8 local school districts and more than 11 secondary schools, working with an average of 3.1 postsecondary institutions.[6]

2. Modest Funding Levels Encourage Collaborative Capacity-Building

Initially, Tech-Prep funding was expected to support the creation of a relatively targeted program, rather than to trigger sweeping school reform or support large-scale ongoing educational services. Not surprisingly, then, the level of resources for Tech-Prep has been relatively modest compared with overall education expenditures. For fiscal year 1994-1995, for example, $103.7 million was made available to states for Tech-Prep, which in turn made grants totaling about $99 million to local consortia. However, Tech-Prep spending for 1994-1995 amounted to only about .04 percent of total spending on elementary and secondary education and about 10 percent of total Perkins Act funding for vocational education.

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[6] Community colleges account for two-thirds of the postsecondary institutions (not including proprietary and apprenticeship programs), and it appears that most community colleges in the country are now involved in some way in Tech-Prep. The total number of community college partners reported by consortia actually exceeds the total number of such institutions in the country, because some colleges are members of multiple consortia.

TABLE II.2

CONSORTIUM SIZES AND CONFIGURATIONS
(Number of Consortia)

Number of Secondary Institutions[b]	Number of Postsecondary Institutions[a]							
	0[c]	1	2	3	4	5 to 10	More than 10	Total
1	2	25	15	9	5	7	0	63
2	3	27	23	7	4	21	0	85
3	1	21	16	6	3	3	2	52
4	0	22	8	6	2	2	0	40
5 to 10	2	101	65	36	15	31	2	252
11 to 20	1	92	47	47	14	37	11	249
21 or more	0	36	28	22	21	40	7	155
Total	**9**	**324**	**202**	**133**	**64**	**141**	**22**	**895**

SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

[a]Includes community and technical colleges, four-year colleges and universities, proprietary schools, and registered apprenticeship programs.

[b]Includes regular secondary schools and secondary independent area vocational/technical centers.

[c]The consortia reporting no postsecondary members are concentrated in a few states that gave out small grants to almost every secondary district. Although these few consortia did not report any postsecondary institution as a "consortium member," most said they had signed articulation agreements. Some of these consortia include area vocational/technical centers that may provide postsecondary, as well as secondary, education.

Consortia therefore operate mostly as agents for change and coordination. Grants to consortia represent a relatively small pool of resources for creating widespread change. For example, if consortium grants were distributed evenly to member districts, each district would receive an average of about $12,000. About a quarter of local consortium grants in 1995 were for less than $40,000. Therefore, Tech-Prep grants cannot be regarded as a primary source of support for widespread ambitious new program initiatives at the district level.

3. Creating Local Consortia Has Brought Employers into Increased Contact with Schools

The creation of local Tech-Prep consortia has had the somewhat unanticipated benefit of bringing employers into greater contact with local schools. Although not mandated by legislation or emphasized in early conceptions of Tech-Prep, employer involvement in Tech-Prep has become common. The Perkins Act encourages educational agencies and institutions to consult with business, industry, and labor but does not require their participation in local consortia as a condition of funding or specify any particular role for them in Tech-Prep planning and implementation. From the beginning, nevertheless, most consortia have included representatives of business and industry as members, with a few states (for example, Washington) over time requiring such membership. In 1993, 72 percent of consortia included businesses or trade associations as members, and this figure grew to almost 80 percent in 1995.

The intensity of employer involvement varies, however. In many cases, "membership" in a consortium is limited to relatively passive participation on governance boards or to hosting meetings. In other cases, employers work closely with school staff to develop technical curricula and identify the academic skills required for a particular occupation. In some consortia, employers help promote Tech-Prep to students and parents and provide opportunities for students and teachers to visit their

worksites. Considerable variation usually exists within consortia; some schools may benefit from the efforts of a major employer, while other nearby districts may not.

Involvement of businesses, trade associations, and labor groups has grown since the early years of Tech-Prep implementation (Table II.3). Substantial growth has occurred in the kinds of activity that traditionally brought the business community into contact with schools: providing employees as speakers or guest teachers in classrooms and providing career awareness opportunities for students through tours and field trips. Passage of the STWOA gave additional impetus to consortia to seek employer participation, as Tech-Prep communities began to compete with other communities to obtain STW grant funds. Thus, the STWOA probably contributed to the dramatic growth reported by Tech-Prep consortia in employer roles such as mentoring and providing apprenticeships and paid work experience.

According to many consortium leaders and school-level personnel, the creation and endeavors of Tech-Prep consortia have brought an important qualitative change to the interaction between schools and employers. Schools have long had local advisory committees for their vocational programs, but these groups often have played perfunctory roles, putting their stamp of approval on the continuation of existing programs. In many consortium communities, Tech-Prep initiatives have given new prominence to the role of employers in local educational affairs.

As a result, Tech-Prep has fueled several shifts in employer involvement. First, Tech-Prep consortia have been instrumental in elevating the status of employers' concerns and expectations about the qualifications of new labor; employers are now more widely viewed by educators as important "customers" of the schools' product. Second, employers have become more involved in the specification of skills students should acquire. This is most obvious where major employers in high-technology fields have become closely involved with schools and community colleges in

TABLE II.3

TYPES OF SUPPORT RECEIVED FROM BUSINESSES, CORPORATIONS, TRADE ASSOCIATIONS, AND LABOR ORGANIZATIONS
(Percentage of Consortia)

Types of Support	Fiscal Year 1993	Fiscal Year 1994	Fiscal Year 1995
Working with Staff			
Developing Curriculum	57	61	67
Defining Program Outlines	49	54	54
Identifying/Redefining Occupational Clusters or Career Areas	36	39	38
Promoting or Marketing Tech-Prep	53	52	55
Supporting Staff Development Activities for Counselors and Instructors	44	51	54
Providing Speakers for Career Education Days	49	57	64
Working with Students			
Providing Career Awareness Opportunities for Students	47	57	62
Arranging for Employees to Teach Classes in School	16	18	22
Participation in Mentoring Programs	20	28	36
Arranging Facility Tours or Job Shadowing	47	58	66
Providing Work-Based Learning or Unpaid Work Experience	32	32	39
Providing Apprenticeships or Paid Work Experience	11	32	39
Providing Priority Hiring	6	8	12
Providing Material Resources			
Providing Awards or Scholarships for Students	18	23	27
Providing Awards or Scholarships for Teachers	6	8	8
Providing Equipment or Materials	29	38	42
Providing Space for Classes or Other Activities	16	21	25
None	24	23	20

SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1993, 1994, and 1995.

NOTE: 702, 839, and 864 consortia responded to the relevant survey item in 1993, 1994, and 1995, respectively.

defining the technical skills that should be mastered in Tech-Prep apprenticeship programs. In addition, however, they have become more forceful in articulating the importance of basic academic and interpersonal skills in the workplace. Third, to help educators understand the modern workplace, employers have provided internships and workplace job shadowing opportunities for teachers and counselors.

In many consortia, these qualitative shifts have been valuable preparation for broadening employer involvement further, as part of efforts to create a STW system. In the short term, these changes might have more symbolic than tangible importance. Employers sometimes play visible roles in promoting Tech-Prep and its goals but have little experience (and, therefore, little substantive role) in developing curriculum; instead, they serve as advisers or helpful critics. Although many more consortia report employer support of various types than in earlier years, these emerging employer roles often have been limited. Nevertheless, a new set of expectations has emerged about how employers can and should work with schools.

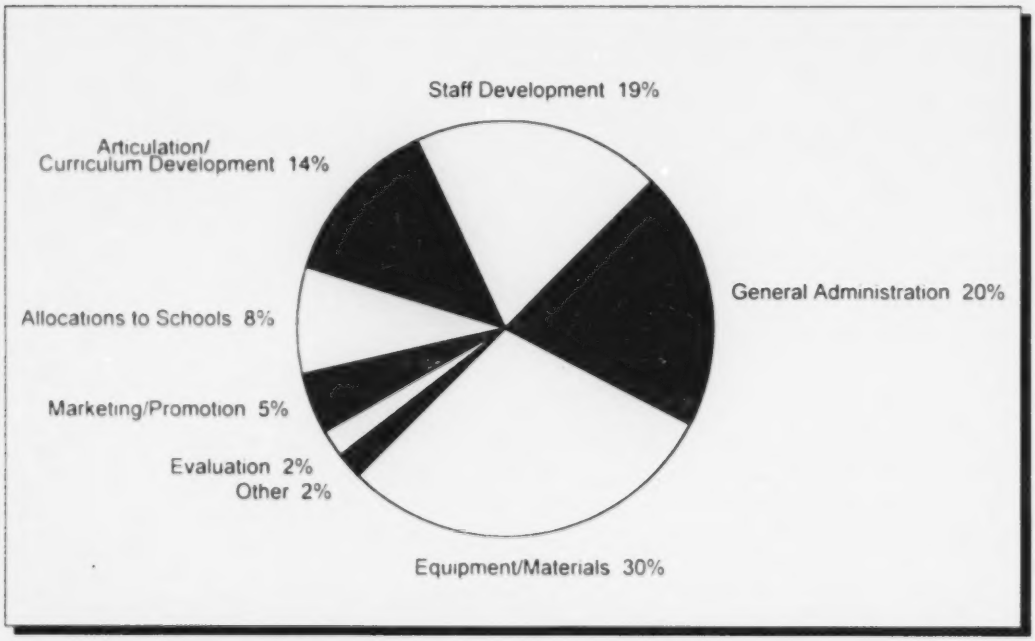
C. ROLE OF LOCAL CONSORTIA

Local Tech-Prep consortia are playing key roles in planning and implementing Tech-Prep across the country. In addition to their general responsibility for coordination and administration of Tech-Prep activities, consortia play four specific roles: (1) promoting professional development, (2) coordinating the process of articulation between secondary and postsecondary programs and developing curriculum, (3) providing materials and equipment to local schools, and (4) promoting awareness and acceptance of Tech-Prep. Almost all Tech-Prep resources are used for these functions (Figure II.2).

1. Promoting Professional Development Is a Central and Valued Role for Consortia

Arranging staff development opportunities is a major focus of consortium activity and resources, for several reasons. From the outset, most consortia have seen an urgent need to familiarize faculty and other staff with Tech-Prep concepts and to help them implement Tech-Prep reforms. In many districts' budgets, however, professional development resources are scarce and often heavily committed to topics related to state academic reforms. At least in the in-depth study sites, consortium staff maintain that training on topics important to Tech-Prep reforms--such as curriculum integration, applied or contextual learning, and career development--would not otherwise be initiated by individual districts and schools. Almost all consortia conduct staff training related

FIGURE II.2
TECH-PREP CONSORTIUM EXPENDITURES, BY CATEGORY



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.
NOTE: Percentages are based on total expenditures compared to total budgets across all reporting consortia.

to Tech-Prep, and staff development is consistently a major expenditure category, accounting for at least 19 percent of consortium budgets in 1995.[7]

Local consortia support a variety of professional development activities for consortium members:

- ***Conference Attendance.*** Consortia commonly pay travel costs to make it possible for member schools and colleges to send faculty, counselors, or administrators to state or national conferences on Tech-Prep.
- ***Local Training Workshops.*** Consortia hire consultants to present workshops on topics such as applied learning or curriculum integration.
- ***Employer/School Interaction.*** Consortia often arrange for teachers and counselors to learn about careers through tours or summer internships at worksites and provide funding for stipends to encourage participation.

Participation in professional development activities related to Tech-Prep is greater at the secondary level than among postsecondary members' staff. In fall 1995, between 92 and 97 percent of all consortia reported that professional development included high school administrators, academic teachers, vocational teachers, and counselors. Postsecondary staff also participate (often because of their involvement in the articulation process), but the focus of most consortium efforts is on creating change at the secondary level. This focus is reflected in a lower rate of postsecondary involvement in professional development; for postsecondary administrators, teachers, and counselors, average reported rates of participation in professional development activities ranged from 70 to 84 percent.

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[7]Professional development activities may account for an even larger portion of consortium expenditures than 19 percent, since the costs of some professional development designed to help teachers learn about applied curriculum and instructional approaches are probably reported in the "curriculum development" category of expenditures.

Teachers view the professional development arranged by consortia as a very useful aspect of Tech-Prep efforts. At the in-depth study sites, we consistently found that many teachers are enthusiastic about the opportunities Tech-Prep has given them to interact and share ideas with other school faculty within their subject areas and across disciplines. Even though the training sessions were often brief, teachers felt they were valuable. Despite this reaction from educators, we would not expect these sessions alone to unleash rapid or dramatic change in teaching practices.

2. Consortia Support Articulation and Curriculum Development

Promoting articulation often requires a combination of urging, facilitating, and ongoing monitoring by consortium coordinators, particularly when the consortium includes many schools and colleges. Busy faculty at both the secondary and postsecondary level need to be informed about their counterparts' courses or programs. Faculty often need help finding appropriate meeting space and some orientation about the curriculum review process and its objectives. After agreement is reached on articulation, coordinators often find it necessary to remind faculty of their agreement to conduct periodic reviews of curriculum.

Consortium staff also get involved in facilitating the development or adoption of curriculum to make academic instruction more applied or to integrate technical and academic learning. Professional development often focuses on helping teachers develop curriculum materials. Some consortium coordinators are instrumental in getting curriculum committees formed with delegates from many schools. Consortium funds may be used to pay expenses and the costs of substitutes for times when teachers attend committee meetings. In some consortia, selected individual teachers or small groups are given stipends to develop interdisciplinary projects. For example, in the Springfield consortium, several English teachers were commissioned to prepare a collection of lesson plans that would be available for all consortium schools to use, and, in another school, a group of teachers

developed a set of interdisciplinary projects involving mathematics, science, applied technology, and communications.

Curriculum development is thus a second major element of what consortia do. Consortia spend a substantial share of their budgets supporting curriculum development and review activities. In fall 1995, coordinators reported, on average, that they spent about 14 percent of their total budgets (including their Title IIIE grants and other funding) for this purpose.

3. Consortium Resources Sometimes Are Provided to Individual Schools

A large part of the consortium's "change agent" role is supporting activities that involve staff from all consortium members. To a limited extent, however, resources are also distributed to individual schools to support their Tech-Prep activities. For example, schools that want to acquire applied curriculum packages sometimes receive consortium funding to make that possible. Outfitting science or technology education laboratories or installing computers in career centers has sometimes been made possible by Tech-Prep funding. On average, consortia report spending about 30 percent of their overall budgets for purchases of equipment or materials specifically for use in the secondary or postsecondary phases of Tech-Prep programs. To a much lesser degree, consortia allocate portions of their grant to schools for them to use for Tech-Prep purposes as they choose. However, most consortia do not make such allocations; only 35 percent report such use of resources, and allocations to schools for their own discretionary use account for just 8 percent of total expenditures.

4. Promotion of Tech-Prep Continues

Although most consortia have been developing Tech-Prep programs for at least several years, they still find it useful to promote Tech-Prep. Tech-Prep continues to encounter skepticism and

resistance because of its association with vocational education. Almost 70 percent of local coordinators identified "negative attitudes towards vocational education and/or Tech-Prep" as an obstacle affecting program implementation. In the sites we visited, coordinators still are concerned about ignorance and lack of enthusiasm for technical careers among students, parents, teachers, and counselors. In fall 1995, more than 90 percent of consortia reported that they were still actively promoting Tech-Prep.

The actual resources committed to promoting Tech-Prep are relatively small, however. In fall 1995, consortia reported, on average, that they spent less than six percent of their overall budgets on marketing and promotion. The most common form of marketing is for consortium representatives to make presentations to students and teachers at member high schools. Such presentations can be used to recruit students to participate at the high school level; in many consortia where these sessions are conducted by staff from a community college, they also introduce students to the college and serve a recruiting function for the postsecondary institution.

Given the diverse interpretations of Tech-Prep and variations in its implementation (see Chapter IV), promotion and marketing mean different things in different consortia and schools. Where Tech-Prep is a clearly identifiable program to which students must apply, promoting Tech-Prep must serve two purposes: (1) generally overcome reservations about technical careers and vocational education; and (2) more specifically, actually recruit students to apply.

Where Tech-Prep consists of changes affecting broad groups of students but there is no identifiable program to enroll in, promotion of Tech-Prep serves only the first purpose. Indeed, many consortia and schools place no emphasis on promoting "Tech-Prep" as a program option for students to choose. Instead, they are likely to stress ideas such as the value and dignity of technical training and education, the importance of all students going on to postsecondary education of some

kind, and the need for all students to choose courses carefully to prepare for their future. They also may promote particular elements of Tech-Prep, such as applied learning, by urging teachers to get involved and students to sign up for classes. The next two chapters explore this distinction between Tech-Prep as a set of particular elements emphasized by local consortia in varying degrees and Tech-Prep as a coherent, structured program of study that brings these elements together for participating students.

III. ELEMENTS OF TECH-PREP AT THE LOCAL LEVEL

A common vision of Tech-Prep, discussed in the years preceding the federal Tech-Prep legislation, was of a set of coherent programs, focusing on particular careers, that students would choose in high school and complete at a community college. Each program would include technical training and related mathematics, science, and communications classes, taught with applied instructional approaches. Students would receive preparatory services to help them choose among defined programs. Over time, some consortia came to envision these programs of study as also including a workplace component to give students chances to apply skills they learn in school.

In reality, consortia have placed different emphases on these elements of Tech-Prep. The result, as explained in Chapters IV and V, is that Tech-Prep takes diverse forms and creates diverse experiences for students. In this chapter, we examine the main elements of Tech-Prep and how their implementation has advanced specific Tech-Prep goals, as a foundation for later discussion of how these elements are combined in the main implementation models. Our primary findings are as follows:

KEY FINDINGS ABOUT ELEMENTS OF TECH-PREP

Tech-Prep has helped increase interest in career guidance. Tech-Prep has helped promote students' awareness of career options, interest in technology, and educational planning. More needs to be done, however, because these objectives are not being pursued in all schools.

Curriculum improvement has focused on making academic classes more applied, but consortia are still refining their approaches. Rather than relying on packaged curricula for designated classes, teachers are increasingly developing their own applied exercises. Interdisciplinary projects are popular but often involve students in only a narrow part of the collaborative work.

Articulation has helped to increase communication between high school and college faculty. Tech-Prep has made articulation agreements between institutions commonplace, but only a small fraction of Tech-Prep students are currently earning and receiving articulated college credit.

Workplace learning is becoming more available, although not specifically for Tech-Prep students. Some consortia have developed small, intensive workplace components specifically for Tech-Prep students. In most cases, however, workplace opportunities that Tech-Prep students can enter are through preexisting or new initiatives that have a differently defined target group.

A. IMPROVING CAREER GUIDANCE

A central goal of Tech-Prep, as envisioned by its earliest proponents and its authorizing legislation, was to help students organize their studies around a career objective and begin preparing to achieve it. The Perkins Act gives most prominence to features of Tech-Prep such as articulation, applied curriculum, and professional development for teachers and counselors. However, the act also foresaw the need for "preparatory services." These services have been widely interpreted as activities that would help students learn about their interests and careers and make decisions about Tech-Prep programs and specific courses.

Two findings concerning career guidance emerge from our evaluation:

- Tech-Prep has added impetus to school districts' efforts to shift from traditional guidance counseling to a greater emphasis on career guidance and development.
- As a result of Tech-Prep implementation and efforts supported by other resources, career development activities are now widely available to students in general; however, efforts are still needed to involve students (even those identified as participating in Tech-Prep) in them more systematically.

1. Tech-Prep Has Contributed to Greater Emphasis on Career Guidance and Development

Federal funding for Tech-Prep has helped to promote greater appreciation in American schools of the importance of career guidance. Traditionally, high school guidance counselors have devoted most of their time to helping students schedule their courses, particularly focusing on meeting admission requirements of four-year colleges.[1] In many schools, guidance departments still focus mainly on the college admission process. The persistence of this focus is due, in part, to the tendency of many communities to judge their schools' success on the basis of rates of college

[1]In some schools, counselors have had to devote increasing attention to students' personal crises and behavioral issues.

matriculation, particularly at four-year institutions. This narrow focus is changing in some schools, however, and the Tech-Prep movement has played a part in promoting that change.

Independently of and well before the advent of Tech-Prep, support was building among guidance staff to place greater emphasis on career development activities and career guidance. Almost a decade ago, national guidelines were developed for comprehensive career development programs (National Occupational Information Coordinating Committee 1989). These guidelines suggested that career development should help students to (1) become aware of their own interests, skills, and place in society; (2) explore potential avenues of education and careers they might pursue; and (3) make decisions about their future. Well before the Tech-Prep legislation, some states were undertaking broad educational reforms that emphasized educational and career planning.

Tech-Prep resources have been used to advance these objectives, in part because Tech-Prep proponents have had to overcome misconceptions about careers and educational paths among students, their parents, and the public. Responsibility for Tech-Prep is most often assigned in schools to the vocational or career technical division and, at the community college level, to administrators of career programs. To promote interest in their programs, these leaders have tried to educate students and parents about career options, promote greater interest in technology and technical careers, and encourage students, with their parents, to plan how their secondary and postsecondary education will help them toward a career goal. Although these efforts typically promote technical careers and Tech-Prep programs, they often affect students in general rather than just those who choose to participate in these programs.

a. Tech-Prep Increases Awareness of Career Options

Tech-Prep consortia use various methods to familiarize students and their parents with career options. These methods include the following:

- ***Career Exploration Software.*** Schools commonly offer students the opportunity--in high school and, sometimes, in middle school--to learn about careers and the education required for them through independent exploration using computer software and databases. In some cases, students access information by linking to state occupational information systems. These activities are most often made available to all students rather than to a selected population of identified Tech-Prep participants. They are typically organized by high school career centers or career technical (vocational) education coordinators.

- ***Career Development Classes or Curriculum.*** Exposure to career information often includes classes or class units in academic classes about the range of careers in today's economy, including their educational requirements, earnings potential, and working conditions. Curriculum often is developed by career technical education staff but made available to--and sometimes required of--students in general rather than just vocational students or Tech-Prep participants.

- ***Employer Presentations and Career Fairs.*** Many consortia and schools routinely arrange for local employers to talk to school classes or meet with students at career fairs to tell them about career paths in their industry. Community colleges host open houses for students and parents about occupational programs they offer and the careers to which they can lead. Some of these events are specifically for students in particular vocational classes or Tech-Prep programs, but others are open to all students in specified grades.

- ***Workplace Site Visits and Job Shadowing.*** Particularly where Tech-Prep has been defined as a structured program focused on particular careers or industries, Tech-Prep resources often are used to support field trips to employer worksites and, sometimes, brief job shadowing. These activities usually involve worksites closely related to students' vocational concentration.

- ***Development of Career Centers and Career Counseling.*** High schools are increasingly developing career centers. In some cases, they expand existing guidance offices, broadening the role of guidance staff who initiate the change. In other instances, career centers are established by career technical education units and operate parallel to the guidance office. Career centers range from simple office or classroom space with reference books to elaborate facilities equipped with computers, CD-ROMs, and Internet connections. Facilities are often located in school libraries as they become more broadly defined "media centers."

In many sites, these methods were used before Tech-Prep consortia were created; however, Tech-Prep resources and promotion often increase the extent to which they are used and available to students.

b. Tech-Prep Has Helped Promote Interest in Technology

Tech-Prep was conceived, in part, to promote entry of well-educated and well-qualified youth to technical careers, and one widely recognized ingredient of success is motivating students to seek such careers. Career opportunities abound for students who complete rigorous, technically oriented two-year community college programs or other comparable training. Getting more students to benefit from such opportunities, however, requires generating higher levels of interest in technology, overcoming misconceptions about technology-based careers, and encouraging students to commit themselves to the mathematics and science classes required for success.

A common school-based strategy to address these goals is to develop "technology laboratory" courses. Educators increasingly see these courses, whether they draw on Tech-Prep funding or other resources, as important preparation for participation in Tech-Prep. The laboratories, which are most often used in middle schools and sometimes in the early high school years, expose students to a range of technologies, the excitement of working with them, and the discipline of carrying out technical exercises and experiments, collecting data, and reporting on their results. Among the evaluation in-depth study sites, for example, schools in the Gainesville and Springfield consortia have been pioneers in the use of such laboratories.[2]

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[2]For a more complete description of technology laboratories, see Hershey et al. (1996).

Lab Courses Promote Interest in Technology and Integrate Curriculum

All ninth-grade students in the Tantasqua, Massachusetts, schools take TECH I, a year long course of hands-on projects in health sciences, communications, construction, business management, manufacturing, and energy/transportation. Students attend for a double period every other day; on alternating days, they spend the same double period in a physical science class. At 42 stations, students undertake exercises such as using a computer program to design a bridge, then constructing a model and testing its load-bearing capacity. In Gainesville, Florida, a wide range of middle school students take a similar elective course, which includes tasks such as shaping styrofoam wings and measuring the lift they generate in a wind tunnel. Required reports are designed to develop communications skills, and students work in pairs to develop teamwork skills. Team teaching by vocational and science teachers emphasizes links between scientific principles and their technical application and encourages academic teachers to use more hands-on exercises.

c. Tech-Prep Encourages Planning and Decision Making

Tech-Prep heightens the importance of careful decisions by high school students about the courses they take, in two ways. First, where participating in Tech-Prep entails choosing a career-focused program of study, students must understand their options: the careers or industries among which they can choose, the academic high school courses they will have to take to complement their occupational courses, and the kind of program they would most likely follow at the postsecondary level. Second, Tech-Prep consortia have helped engender schoolwide attention to career concerns and, as a result, promoted several changes in guidance practices that affect all students.

The most common way that Tech-Prep schools help students into a program of study is to inform them about the courses they should take to start down a career path. We observed two ways that schools convey this information. The less common way is to provide structured information about the combination of academic and vocational classes students will take if they enter a particular Tech-Prep program (see Chapter IV). In the Dayton consortium, for example, structured Tech-Prep programs exist in allied health, industrial engineering automotive technology, electronics

engineering, and computer support. The consortium runs a Tech-Prep Awareness Day for prenominated candidates in 10th grade. The purpose of this day, which includes attendance at Tech-Prep classes, job shadowing in the students' tentatively preferred career area, and sessions in the community college labs with Tech-Prep instructors, is to ensure that students are serious and are making informed choices before they choose a program and enter it the next fall.

The more common way to convey information about choosing courses related to career interests has a more general purpose than helping certain students choose a Tech-Prep program of study. Instead, the emphasis is on encouraging all students to give careful consideration to their postsecondary education plans and their ultimate career interests as they choose high school courses. We found three methods for doing so in the in-depth evaluation sites:

- ***Education Development Plans.*** Many schools in Tech-Prep consortia encourage or even require students to prepare and periodically update a personal plan that identifies a tentative career interest, the postsecondary education or training (if any) that they plan to pursue toward that goal, and the courses they will take in their remaining high school years to prepare for that postsecondary activity. Usually, such plans are prepared initially in ninth grade, then updated annually--although, unfortunately, later reviews sometimes are cursory. Some states now mandate or strongly encourage use of such plans for all students, not just Tech-Prep participants.

- ***Career Planner Software.*** Some schools use computer software to help students develop educational plans. We found the most elaborate example in Salem, Oregon. Students use interest inventories to identify a tentative career interest. When they select an occupation of interest, the software identifies which of the state-defined career clusters--with its associated Certificate of Advanced Mastery (CAM)--is most relevant to their interests. The software then lists high school courses students should take, not only to graduate, but also to meet the CAM requirements, as well as the community college programs and courses they would then most appropriately pursue.

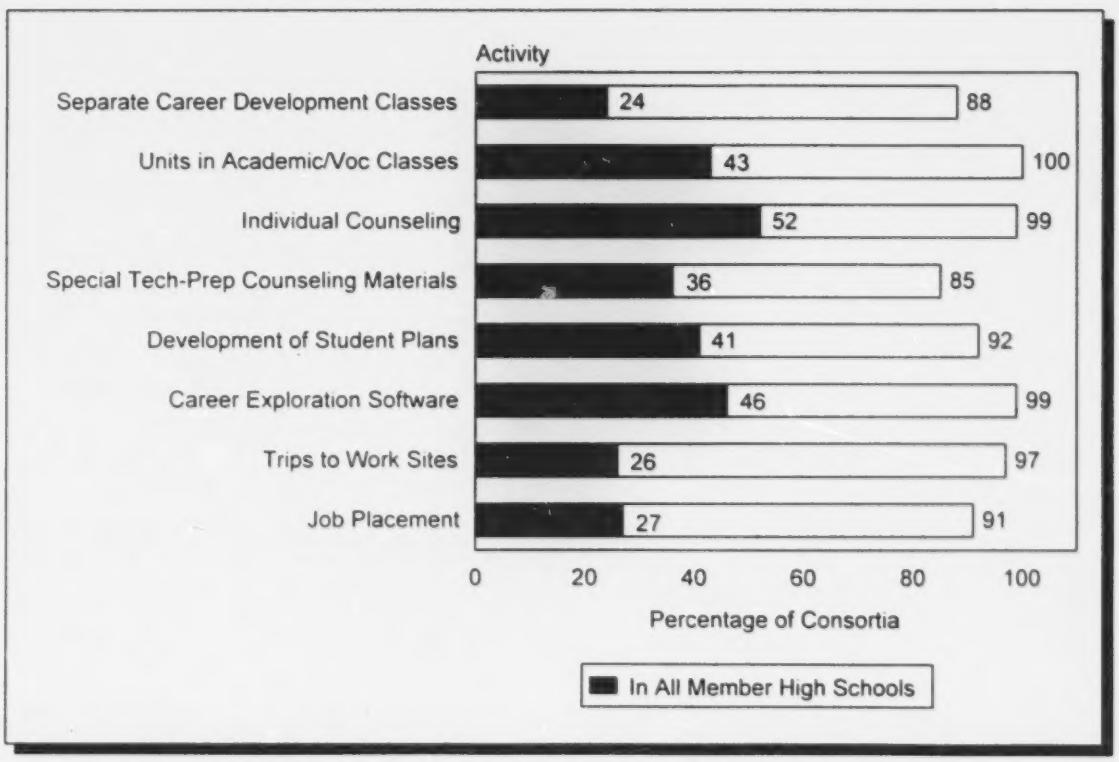
- ***Teachers as Auxiliary Counselors.*** Faced with high student-to-counselor ratios, some schools are training teachers to advise students on course selection, to ensure that students fulfill graduation and postsecondary admissions requirements and that their choices reflect their expressed career interests to the extent possible. For example, at Springdale High School in Arkansas, teachers conduct annual conferences with students and their parents and serve as advisers throughout the school year. In McKay High School in Oregon, students register for courses with the help of teachers in their CAM

(career) area, so teacher-advisers are more likely to have some familiarity with the broad career area of interest to students and the relevant course sequences.

2. Career Development Activities Are Becoming Widely Available

Due in part to Tech-Prep coordinators' efforts and Tech-Prep funding, schools in Tech-Prep consortia have made career development activities widely available. The three annual evaluation surveys of local consortia conducted in 1993 through 1995 show that nearly every Tech-Prep consortium in the country offers some form of career development activity to Tech-Prep students (and, usually, to students in general) in at least some member schools (Figure III.1).

FIGURE III.1
CONSORTIA OFFERING CAREER DEVELOPMENT IN ANY HIGH SCHOOLS



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

The availability of career development activities for students is gradually expanding. For example, according to data from the Tech-Prep consortium surveys, special counseling materials about Tech-Prep career areas were available in every high school in 28 percent of all consortia in 1993; by 1995, they were universally available in 36 percent of consortia. Universal use of student educational plans in all high schools was reported in 33 percent of consortia in 1993 and in 41 percent by 1995.

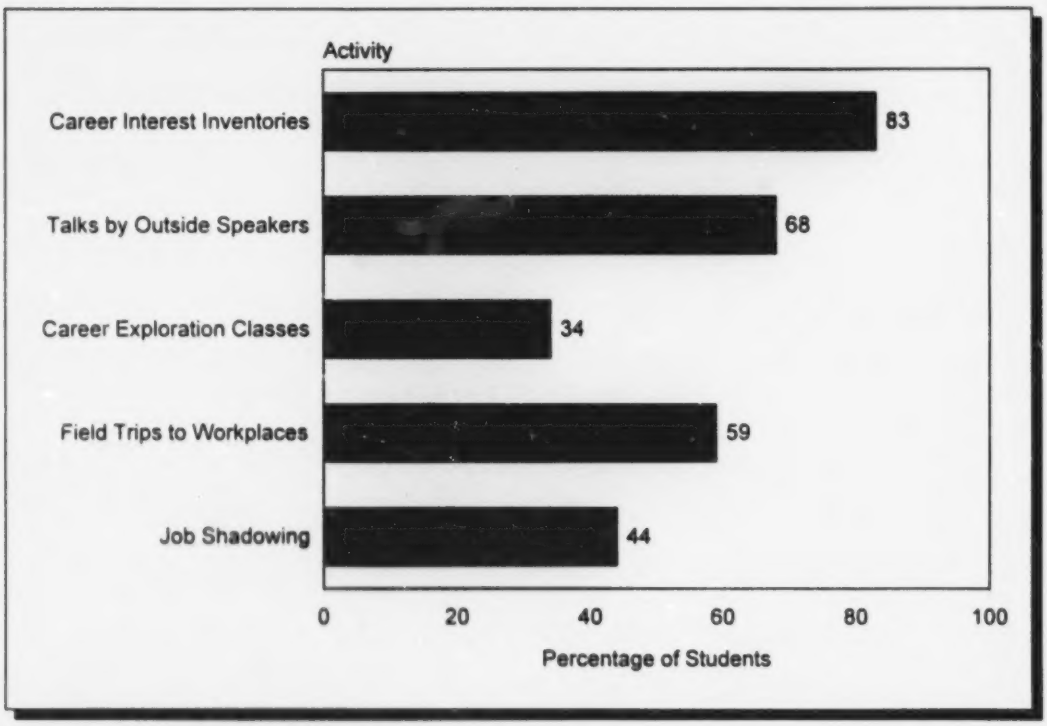
Defining and implementing career development activities remains the bailiwick of individual districts and schools, so it is not surprising that the nature and availability of these activities vary widely. On the basis of our in-depth study site visits, it appears that even when Tech-Prep consortia help to formulate a standard set of recommended career development activities, member schools choose whether or not to adopt and implement them. As a result, substantial variation exists in the types of career development activities individual schools offer. Most specific career development activities are offered in a quarter to half of the high schools that belong to Tech-Prep consortia. In some cases, however, such as the Mid-Willamette Education Consortium based in Salem, Oregon, a combination of design initiative and financial resources is used to encourage widespread buy-in by districts and schools to a common approach to career development. There is no reason to believe that every type of career development activity will be offered in every school, but such leadership from the consortium level can help overcome the resistance to or ignorance of career development strategies in some schools. It can thus lead to greater consistency in approach across member schools.

Guidance and Counseling Design Team Encourages Consortiumwide Approach

The consortium in Salem, Oregon, stresses the importance of a standard set of career development activities that all consortium members would adopt, in large part because there is substantial student movement across districts. A design team of secondary and postsecondary representatives identified career development activities suited for each grade level. The consortium made subgrants to schools conditional on commitment to implement the career development plan, and consortium staff monitor fulfillment of the commitment. The consortium provides technical assistance and training (for example, on how to use the career interest inventory, aptitude tests, and career path planner that are part of the overall program).

In the 10 in-depth study consortia, a large fraction of students are exposed to career development activities, particularly those that can be carried out in school. In a survey about 18 months after their high school graduation, a sample of Tech-Prep graduates at the selected schools in the 10 sites were asked whether they had ever participated during high school in activities such as completing career interest inventories, attending talks by employers on career options, taking career exploration or awareness classes, going on worksite field trips, or engaging in job shadowing at employer worksites (Figure III.2). As many as 83 percent of the students had completed career interest inventories, and 68 percent had attended talks by employers on career options--both school-based activities. More intensive experiences (for example, classes focusing on careers or workplace activities such as worksite visits or job shadowing) were less common.

FIGURE III.2
STUDENT PARTICIPATION IN CAREER DEVELOPMENT ACTIVITIES



SOURCE: Tech-Prep Student Follow-Up Survey, 1997.

The expansion of career development activities for Tech-Prep participants can best be interpreted as part of a broader trend affecting other students as well, rather than an accomplishment affecting only Tech-Prep students. Where we saw consortia and schools at in-depth study sites emphasizing career development, the aim was typically to enhance such activities for all students, not just Tech-Prep participants. This pattern is substantiated by comparison of the Tech-Prep student survey data with results from another study. Recent data from a representative survey of all 12th graders in eight states' school-to-work partnerships found rates of participation for the general student population very similar to those shown in Figure III.2 for Tech-Prep participants in the 10

in-depth study sites (Hershey et al. 1997).[3] Efforts to promote the career development and guidance element of Tech-Prep thus reinforce pursuit of a goal that educators increasingly see as important for all students.

B. ENHANCING CURRICULUM

The early proponents of Tech-Prep and the authorizing legislation envisioned a program that integrates technical instruction and strong academic preparation, and local consortia have greatly emphasized that ideal. Advocates have argued that integrating academic and vocational education can help students learn better than they do when academic material is taught without opportunities to apply it. The Perkins Act as reauthorized in 1990 explicitly requires programs that receive federal vocational funding under its provisions to "integrate academic and vocational education . . . through coherent sequences of courses so that students achieve both academic and occupational competencies" (Section 235). Title IIIE, in defining Tech-Prep, calls for programs that build technical skills but also competence in mathematics, science, and communications; it specifically stresses applied approaches to teaching academic subjects (Section 347), a common form of curriculum integration. Local Tech-Prep consortium coordinators, responding to the national evaluation surveys, have consistently identified "improving integration of vocational and academic instruction" and "developing curricula and instruction to promote hands-on learning" as the most important topics for staff development after basic orientation on general Tech-Prep concepts.[4]

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[3]For example, the survey of all 12th graders in the eight states found that 79 percent of all seniors had completed interest inventories, 78 percent had attended employer talks, and 57 percent had gone on worksite visits.

[4]In all three surveys, about 70 percent of consortium coordinators identified these topics as "highly emphasized" in staff development efforts, compared with ratings ranging roughly from 35 to 65 percent for other aspects of Tech-Prep such as marketing, work-based learning, career (continued...)

We reached four main conclusions about the nature and progress of efforts in Tech-Prep consortia to integrate curriculum:

- Applied academic curricula have been adopted or developed in at least some schools in almost all consortia, although many member schools are still not involved in this effort.
- Early enthusiasm for off-the-shelf applied curriculum packages is giving way to greater emphasis on local curriculum development.
- Curriculum change associated with Tech-Prep is far less common at the college level than in high schools.
- Interdisciplinary projects often bring teachers from various fields together to collaborate on exciting and highly visible endeavors, but it is a logistical challenge to give students a broad exposure to all the tasks involved.

1. Applied Academic Curricula Are Widely Used, But Broader School Involvement Is Still Possible

The most widespread strategy for curriculum integration is to develop or adopt applied curriculum and applied instructional approaches in academic classes, particularly in mathematics, English, and science classes. We identified four kinds of changes in academic classes that have led educators to describe them as more applied:

- ***Classroom instruction involves more hands-on activity.*** Students carry out experiments in science classes, perform physical measurements in math classes as a basis for calculations, and gather information outside the classroom for their English essays or other written work.
- ***Curriculum materials draw on relevant occupations.*** Classroom exercises, experiments, research assignments, and classroom discussion expose students to careers they might be considering for the future.

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[4](...continued)
development, articulation, and secondary-postsecondary cooperation (see Silverberg 1996; and Silverberg et al. 1997).

- ***Assignments promote work styles called for in employment settings.*** Students are encouraged to work together in teams, assess their own work and their fulfillment of assignments, analyze problems so they can come up with solutions, and resolve interpersonal conflicts without disrupting their work.

- ***Classwork and assignments require use of relevant theory in tasks directly related to students' vocational classes.*** Academic skills are practiced in ways that relate to the technical skills students are working on.

Which students such changes affect depends largely on how consortia and schools choose to implement Tech-Prep (see Chapter IV). Where Tech-Prep is a clearly defined program for particular students, schools usually designate certain classes that will be taught in more applied ways and try to fill them with Tech-Prep participants. In other schools, however, targeting of applied curriculum is less systematic. Often, certain teachers begin adopting more applied approaches. In some cases, counselors then identify students they think would benefit and place them in those sections. In other cases, schools try gradually to encourage all teachers to use applied instructional methods, and the affected classes are open to any student. Even in such instances, however, counselors are most likely to advise students who are doing poorly in traditional, more theoretically taught classes to take classes where teachers are stressing applied, hands-on exercises.

Tech-Prep consortia almost universally have used at least some of these approaches in some of their schools. The fall 1993 Tech-Prep survey showed that, in the previous two school years, 80 percent of consortia had implemented new or substantially revised academic courses to emphasize contextual or applied learning in at least some of their member schools. Many of the same consortia, and additional ones, implemented new applied curricula in the next two years (school years 1993-1994 and 1994-1995). Overall, 96 percent of all the consortia surveyed in fall 1995 had adopted applied curricula to some extent over the previous four years. Consortia continue to extend use of applied curricula to additional districts and schools among their members.

The effort to make curriculum and instruction more applied, however, is still concentrated in only some of the schools that make up Tech-Prep consortia (Table III.1). For example, the most popular commercially available curriculum, in mathematics, was in use in fall 1995 in about half of all high schools in Tech-Prep consortia. New, locally developed applied math curricula had been adopted over the previous two years in fewer than one-third of consortium high schools.[5] Introduction of new applied curricula and use of applied curriculum packages in other subject areas is more limited. Even within schools, our site visits suggest that often it is a few teachers who become enthusiastic about applied teaching approaches; their enthusiasm may or may not ignite broader interest. As a result, the curriculum changes they are championing often are being pursued in only a few class sections.

2. Many Schools Must Shift Strategies for Making Curriculum More Applied

Educators continue to have a strong interest in making academic instruction more applied. Many of them believe that applied instructional approaches have positive effects on students, and the argument for more applied teaching is appealing to an increasing number of teachers. Discussions with staff and students at schools in the 10 in-depth evaluation sites identified anecdotal examples of how these curriculum changes can benefit students:

- ***Attracting More Students to Science.*** When Tech-Prep was getting under way at Rogers High School in the Springdale consortium in Arkansas, there were only enough students to fill a single physics class. A new teacher was hired who was enthusiastic about applied, hands-on experiences in science classes; he invited other science teachers and their students to a "physics open house" where he demonstrated fascinating

[5]The total proportion of consortium schools with *any* applied math curricula is thus probably no more than 89 percent, and probably lower, since many schools offer a mixture of commercial and locally developed applied curricula. Some schools may have developed their own local applied curriculum before 1993, but field observation suggests such efforts were not widespread.

TABLE III.1

USE OF APPLIED ACADEMIC CURRICULA

	Consortia		Secondary Schools	
	Number	Percentage	Number	Percentage[a]
Locally or State-Developed Curricula Introduced Recently (1993-1995)				
Biology	424	47	1,552	15
Chemistry	329	37	1,071	10
Mathematics	566	63	3,243	32
Physics	402	45	1,367	13
English and Other Language Arts	504	56	2,787	27
Economics	107	12	295	3
History	67	7	147	1
Other	174	19	608	6
None	233	26	--	--
Commercial Curricula Currently in Use				
Applied Biology/Chemistry	561	63	2,168	21
Applied Communications	637	71	3,524	34
Applied Economics	130	15	479	5
Applied Mathematics	748	84	4,887	48
Chemistry in the Community	110	12	329	3
Principles of Technology	631	71	2,499	24
Other	76	8	268	3
None	87	10	--	--

SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

[a]The denominator used in calculating the percentage is the total number of secondary schools in all consortia responding to the survey.

experiments. By school year 1996-1997, there were six sections of physics and five sections of applied physics.

- ***Opening the Way to Advanced Math for More Students.*** An energetic math teacher at rural Newberry High School in the Gainesville consortium has triggered department wide changes among teachers and stronger performance from students. She teaches several classes of pre-algebra using an applied math curriculum package; she has introduced similar applied approaches in her trigonometry and calculus classes and has inspired other teachers to do so in their classes. More students are taking higher level math as a result; enrollment in the small school's calculus classes rose from 4 in 1995-1996 (when the teacher arrived) to 16 who signed up for fall 1997.

A far more commonly described benefit of the wide interest in applied curriculum has been improved communication among faculty members. In many consortia, coordinators have instigated the creation of curriculum committees that include representatives from member high schools and districts. Science, math, and English teachers meet with counterparts from their particular disciplines to develop common curriculum approaches, and sometimes, with academic teachers from other disciplines and vocational instructors to develop integrated curricula or projects. Sometimes these meetings result in the development of curriculum handbooks or a compendium of applied exercises. Teachers in many schools we visited commented that the most important consequence of Tech-Prep for them has been the opening of communication among teachers.

The process of implementing applied academic curricula is complex, however. Adoption of applied approaches has been gradual, and progress has been uneven. Vignettes of individual schools in the in-depth evaluation consortia (Table III.2) illustrate challenges schools have encountered and the ways in which some have had to rethink or refine their original implementation strategies. Three trends have emerged:

- ***Increasing Rejection of Applied Curriculum Packages.*** In almost every consortium we visited, enthusiasm for commercially available applied curriculum packages has waned. Teachers complain that some curricula are too difficult for the grades in which

TABLE III.2

APPLIED ACADEMICS AT THE SCHOOL LEVEL: THREE VIGNETTES OF IMPLEMENTATION EXPERIENCES

Consortium Now Emphasizes Choice Rather than Requiring Applied Academic Classes
At first, one consortium required applied courses in its Tech-Prep programs: three years of applied math, two of applied communications, and, typically, two of applied science. However, teachers and students often viewed applied courses as second-best or remedial, so making them a centerpiece of Tech-Prep reduced its appeal. In some schools, teachers found these classes required more preparation and were harder to teach. Some counselors considered the courses low-level, and teachers often felt they got the weakest students. Many teachers were uninterested, so applied classes sometimes were assigned to the least experienced teachers. As a result, the consortium is redefining Tech-Prep, encouraging students to take the most demanding math, English, and science classes they can instead of routinely assigning them to a designated applied class. This change increases flexibility. There is a trade-off, however; the change can reduce program cohesiveness. With students no longer guided into the applied classes, it is harder to cluster those taking the same vocational programs in their academic classes and, thus, harder to develop links between academic and vocational curriculum.
Applied Math Package Not a Panacea
Two schools in another consortium made an applied math package the keystone for their efforts to raise mathematics requirements and performance for high school students. They have succeeded in eliminating low-level math classes. However, both schools have now turned away from their original strategy. One school finds that math skills are still weak and is trying a new approach. All students will take an algebra readiness test in eighth grade; those who do poorly will be offered a summer algebra readiness course. All students will start the same algebra class in ninth grade; after nine weeks, they will be sorted into classes working on the same curriculum at different paces, so that all eventually get the chance to master algebra and geometry, at a minimum. The second school found that the packaged applied math curriculum was too difficult as a primary curriculum for many 9th and 10th graders because it required too much reading. The school has developed its own "Math Tech" courses, using applied math materials as supplements.
Success at High School Level Depends on Perceptions of Applied Curricula at Junior High Level
As part of its effort to raise the level of science instruction, one consortium district introduced applied biology in its junior high school. However, counselors there perceived the class as a low-level one and pushed about 25 percent of 9th graders--recognized by their peers as students with poor academic performance--into the class. High school staff, eager to broaden use of applied curricula, must work doubly hard now to overcome this perception among their incoming 10th graders and attract them to classes with more applied approaches.

they are introduced or that curriculum exercises are too mundane. Schools find commercially available packages expensive, particularly in science, where labs are costly to outfit and restock. Teachers often disagree with the sequence in which topics are introduced.

- ***Declining Emphasis on Designating Certain Classes as "Applied."*** At first, many schools specified certain math, English, or science classes as "applied"--particularly when they were based on purchased curriculum packages. However, these classes sometimes became marked by students and counselors as remedial or for "dummies," robbing them of the positive appeal teachers hoped to create. Even when the classes were as challenging as what they replaced, four-year colleges have often refused to recognize them as academic credits meeting admissions requirements. As a result, schools increasingly are choosing to encourage infusion of more applied content and teaching methods into a wide range of classes and dropping the word "applied" from course titles.

- ***Increased Focus on Teacher Involvement in Curriculum Development.*** As an alternative to purchasing curriculum packages, many schools now choose to develop their own new curriculum, sometimes drawing selectively on ideas from those packages. Teachers have noted that some textbook publishers have dramatically responded to interest in more applied instruction, providing far more hands-on exercises and connections to the world of work in their latest editions. This trend, teachers note, helps extend the advantages of more applied approaches to academic instruction to more students than those viewed as participants in Tech-Prep.

3. Effect of Tech-Prep on Postsecondary Applied Approaches Is Uncommon

In many instances, postsecondary members of Tech-Prep consortia have been instrumental in promoting applied approaches to academic instruction at the secondary level, but similar changes in their own institutions are uncommon. Visits to the in-depth evaluation sites clearly indicated that, where community college staff are consortium coordinators, they often play a key role in organizing multischool faculty committees to develop strategies for making math, English, and science curricula more applied. In most consortia, however, there has been little concerted effort at the community colleges themselves to promote similar shifts in curriculum and instruction.

Isolated examples of interest in applied academic approaches do exist at the college level, including some at the in-depth evaluation sites. A math instructor at Santa Fe Community College

in Gainesville who teaches both high school and college classes developed an applied math class for students in the college's automotive, construction, and zoo technology programs; this class substituted for College Algebra I. At Chemeketa Community College in the Salem consortium, sections of required communications and writing classes were modified to focus on specific occupational areas and to use project-oriented and hands-on teaching techniques. For example, students in the automotive program were given writing assignments relating to brake systems when their technical instruction was focusing on that topic. Illinois Central College prepared a "Methods of Integration" guide to help faculty develop courses and projects integrating academic material and hands-on activities. One result was a "Math of Medications" course team-taught by faculty from the mathematics department and the nursing program.

Such examples are uncommon, however, for several reasons. Professional attachments to traditional academic disciplines are even stronger among many community college faculty than at the high school level, and they often lead instructors to resist changes they sometimes interpret as watering down their courses or lowering standards. Particularly in mathematics and the sciences, community college curricula must satisfy requirements of four-year schools to which many students aspire to transfer, and those requirements often complicate curriculum revision.

Perhaps most important, the impetus to make community college academic classes more applied as part of a Tech-Prep initiative is weakened by difficulties translating high school participation in Tech-Prep into college enrollments. In most consortia, the percentage of high school students who have been exposed to applied academic classes and then gone to the local community college is low, and those who do are often not identified as having been Tech-Prep students in high school (see Section C). For example, community colleges in one of the in-depth study consortia made serious

efforts to change college math classes in anticipation of Tech-Prep students' enrollment but were unable to sustain the change for lack of students.

Colleges Develop Applied Math, But Enrollment is Low

One consortium tried to extend the applied approach to college mathematics. A consortiumwide curriculum committee defined "Tech-Prep Math 1 and 2"--a more applied version, over two semesters, of the colleges' standard first semester "Tech Math." These classes were to be tailored to Tech-Prep participants from member high schools and be based on the more advanced applied math modules not covered in the high schools. At one college, the course was taught, but few students enrolled. At a second college, the course was approved and listed in the catalogue; not enough students registered, however, and it was canceled. College administrators have concluded it is better for Tech-Prep coordinators to work informally with instructors interested in applied approaches, than to go through the complicated process of creating new courses specifically for Tech-Prep students.

4. Giving Students Broad Roles in Interdisciplinary Projects Is a Challenge

Many consortia and schools have recognized the potential value--for teachers and students--of cooperative projects that break down barriers among academic disciplines, among skills used in various occupations, and between academic and technical learning. In almost every high school, examples can be found of projects ranging in length from a few days to an entire semester or more, involving multiple teachers and students from a variety of classes.

Project-based learning can involve both academic and vocational teachers. Some projects involve only academic teachers--such as the effort by a team of math and science teachers in a Fresno school to engage students in analyzing overcrowding problems at Yosemite National Park and developing proposals to address them. Other projects may involve teachers and students from a variety of vocational and academic classes. For example, it is common for high school vocational divisions to design and complete a construction project--sometimes a whole house--with roles played by students from construction trades classes, graphic arts classes (to help in the design work),

marketing classes (to help sell the finished product), and English classes (to help organize and deliver presentations to school administrators). At Putnam High School, in the Springfield consortium, such diverse efforts have been mobilized to design and construct an old-style trolley barn and trolley car in collaboration with a local historical museum.

These interdisciplinary projects can create exciting and fulfilling opportunities for teachers and students. Most projects we observed gave students a strong sense of how complex endeavors require coordination, consistency of planning for all project components, careful scheduling, and management of people with diverse roles. Thus, interdisciplinary projects effectively introduce students to what it is like to be part of a larger, complex enterprise. They also can create a highly visible focus for school pride and community attention.

Such projects, however, do not necessarily give students a chance to integrate a variety of skills. Students typically are assigned tasks that draw on skills they are learning in a particular class they are taking that is involved in the project. For example, graphic arts, construction trades, marketing, and English teachers might agree to collaborate on a project, but individual students will be involved only in the tasks relating to the class they attend that is part of the project. Rarely do they get to work on tasks involving multiple disciplines, unless a project is organized around a group of classes attended by the same students (and such clustering is unusual).

In such projects, scheduling difficulties are the primary factor limiting students' opportunities to integrate skills and disciplines. In cases we have observed, projects that engage multiple teachers rarely are accompanied by successful clustering of students in their classes, even when the initial aim is to do so. Students' diverging interests and varied class choices, as well as teachers' schedule constraints, typically interfere, even when the project initiators have recognized the extra benefit to students of being grouped together to form a cohesive project team. One solution, which we

observed in a Fresno high school, is to conduct projects with classes taught in the same period of the day, so that students can sometimes be "shuffled" and take on tasks related to classes other than the one they normally attend at that time. As suggested in Chapter IV, the more targeted approaches to implementing Tech-Prep, in which students with common career interests follow a cohesive program of study as a group, would make it easier to create such project teams.

C. ARTICULATION BETWEEN SECONDARY AND POSTSECONDARY PROGRAMS

A central goal of Tech-Prep has been to create a "seamless," occupationally focused program that students would begin in high school and complete in a community college.[6] This term implied several specific aims, primarily pertaining to students' technical preparation. Articulation would reduce redundancy between students' high school vocational courses and college career curricula, and it would align secondary and postsecondary course content so the latter would be a natural extension of the former. As a result, students would be able to take more advanced courses at the college level and attain higher skills. The definition and promotion of such a coherent sequence would increase students' propensity to enter the college programs. It was anticipated that some articulation agreements would allow students to earn college credits while still in high school, creating further incentives for postsecondary education.

Tech-Prep consortia have made articulation a central focus of their efforts, although the consequences for students remain limited. We reached three major conclusions about the significance of articulation in Tech-Prep:

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[6]The Tech-Prep legislation describes the aim of articulation as providing students with a "nonduplicative sequence of progressive achievement" across high school and community college (Section 347).

- The articulation process can help improve communication among faculty and upgrade vocational curricula, but ongoing attention must be paid to the process to sustain its benefits.

- Articulation agreements are now extremely common, but they usually focus on identifying specific high school classes that can be used to earn credit for an equivalent college course, rather than on linking broad programs at the high school and college levels.

- Taking an articulated vocational class is a common ingredient of Tech-Prep high school participation, but relatively few students actually are receiving postsecondary credits based on those courses.

1. Main Benefit of Articulation Is Stimulation of Secondary-Postsecondary Communication

The articulation of secondary and postsecondary programs can have important benefits. On the basis of our detailed ongoing examination of 10 consortia and their member schools over a four-year period, we identified two ways in which articulation has had positive results. First, it has improved communication between high school and college faculty. Second, it has promoted improvement of vocational curricula.

a. Improved Communication Among Faculty

Particularly among high school teachers, the articulation process is often valued as a form of professional development and as a way to reduce professional isolation. Many high school academic and vocational teachers have little opportunity for exchange with college faculty and little exposure to the content and methodology of the postsecondary programs to which their students may advance. Site visits at the 10 in-depth study consortia consistently showed that faculty--particularly high school teachers--value the communication that their involvement in Tech-Prep implementation opens up for them. In many cases, this communication is set in motion by the creation of faculty articulation committees to review existing high school and college curriculum. When asked in the

fall 1995 consortium survey to identify the most successful aspects of Tech-Prep, local coordinators most often identified "articulation" and "secondary-postsecondary collaboration."

b. Upgrading and Consistency of Vocational Curricula

Evaluation site visits highlighted how the articulation process sometimes triggers upgrading of high school programs and, in more unusual cases, changes at the college level. For example:

- ***Articulation in Ohio is part of comprehensive vocational program upgrading.*** In Dayton, as elsewhere in Ohio, Tech-Prep Competency Profiles (TCPs) are prepared by committees of high school and college faculty and employers, identifying skills that schools should help students develop at both educational levels. Sometimes entirely new technical curricula are developed for Tech-Prep occupations at both levels.

- ***Some high school courses adopt college curricula and instructional materials.*** Some articulation committees conclude that the simplest way to make a high school course equivalent to an introductory college course is to adopt its textbook and course outline. For example, the Gainesville high school drafting technology program adopted the college textbook for courses that will contribute to college credit.

- ***College programs sometimes see need to "catch up" to high schools.*** The articulation process sometimes uncovers room for improvement at the postsecondary level. One Massachusetts community college, for example, realized that its information systems program need no longer emphasize office applications, because graduates of high school computer systems programs already had those skills. The college also found it needed to respond to student and labor market demand; it de-emphasized programming courses and added courses in network and user support.

Such benefits of articulation, however, can wither if schools and colleges do not commit resources to ongoing communication and review. Over time, college and high school curricula face their own pressures to change that are independent of concerns for coordination with each other. These include changes in students' abilities and expectations, changes in state requirements or licensing provisions, and turnover in faculty and shifts in their interests. It was clear from evaluation site visits that, in some schools, faculty view the articulation process as a one-time, intensive effort rather than the start of an ongoing collaboration. This view undoubtedly stems in part from the

pressures on faculty and the difficulties many face finding time to arrange or attend curriculum analysis meetings. Even when articulation agreements provide on paper for periodic review and update meetings, they may be neglected. One college Tech-Prep coordinator, for example, acknowledged that articulation agreements often are neglected unless she reminds committees, schedules meetings for them, provides meeting space, and prepares and circulates agendas. Many consortia do not have enough staff to handle such logistical tasks.

Sustaining the benefits of articulation thus requires ongoing resources. The most obvious sustaining factor is the existence of a consortium coordinator who prompts periodic reviews and reports on the status of articulated curriculum. It is also important that faculty be given incentives and time to view articulation as an ongoing and rewarding process. For example, faculty can be given small stipends for chairing ongoing "articulation teams." High school teachers can be invited to observe or participate in college classes and events focusing on their discipline. Teaching exchanges and team teaching can be arranged between high school and college faculty (as practiced in the Gainesville consortium). Investments in equipment for vocational programs can be made contingent on evidence of ongoing review by joint secondary/postsecondary/employer committees.

2. Articulation Agreements Are Now Prevalent, Usually with a Focus on Course Credit

Articulation takes place in several stages. High schools (or districts) and postsecondary institutions must first agree in general terms on the objectives of articulation and a framework for further specification. Faculty from comparable departments at both levels then review their curricula; in doing so they may identify ways in which the high school (and possibly college) courses should be revised, and they may agree on the conditions under which students who complete a high school course sequence will be given college credit. This stage usually results in a specific

agreement about a particular set of high school and college courses. Later, there may be ongoing periodic review of the agreement, possibly leading to further updating of course curricula.

This kind of process has been conducted, or at least initiated, in nearly every Tech-Prep consortium. Articulation already was being undertaken before the Tech-Prep Education Act was passed in 1990. Articulation of some sort has been practiced in some states since the 1920s, and the National Institute of Education promoted the concept in the early 1970s. By the late 1980s, many states were actively encouraging articulation. In fact, in 1995, more than half of all Tech-Prep consortia reported that at least some of their member colleges and high schools had concluded articulation agreements before the consortium was created. However, intensified attention to articulation following passage of the 1990 Tech-Prep amendments to the Perkins Act has greatly broadened the scope of articulation. By fall 1995, 96 percent of the nation's Tech-Prep consortia reported that at least some specific articulation agreements had been signed between college and high school members.[7]

Articulation agreements differ on several dimensions. They may:

- Focus on relationships between particular courses at the high school and college level or more broadly link an overall program of study at the high school level to a college program
- Define how high school students can earn college credit or simply focus on aligning curricula to eliminate redundancy
- Provide for a simple one-time review and agreement or create more extensive forms of ongoing collaboration between high school and college faculty

[7]Articulation is a required feature of Tech-Prep programs, but some newer consortia may not have been involved in articulation in earlier years and may still be negotiating agreements.

a. Course-to-Course Articulation Is More Common than Program Articulation

Articulation usually revolves around a review of particular (presumably comparable) high school and college courses to determine if the content of a particular high school course or course sequence meets requirements to earn college credit.[8] This approach is far more common than "program articulation," which involves linking a combination of high school academic and vocational sequences to postsecondary programs. The course-to-course articulation process might, for example, find that a two-year high school vocational sequence of drafting and computer-assisted design (CAD) covers the same skills as the first-year CAD course at the college. This review involves faculty in identifying the skills that the sequence of high school and college courses should develop in students at each stage. The review may reveal ways in which the high school curriculum must be enhanced to become equivalent to the introductory college course; sometimes, high school teachers are asked to adopt a college textbook. This articulation process usually engages community college faculty in bilateral discussions with their counterparts at each consortium high school, since each high school's courses must be reviewed.

Some consortia, however, have attempted broader program articulation. The Gainesville consortium defined comprehensive programs of study, including both vocational and applied academic courses, that would lead to career programs at the community college. Articulation agreements required that students complete the specified levels of academic course work, as well as vocational sequences, to earn college credit for the basic-level career program course.

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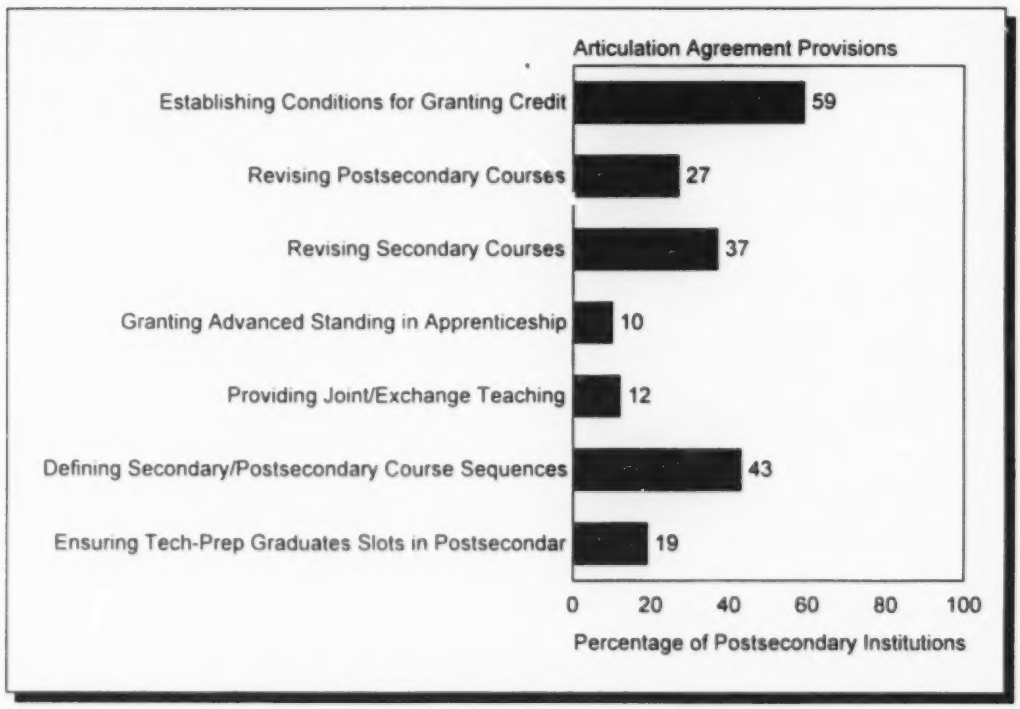
[8]Site visits suggest that articulation usually focuses on vocational courses. In rarer instances (such as in the Fresno, California and Hartford, Connecticut area consortia), community colleges define conditions under which certain high school academic classes can earn college credit as well. Many schools and colleges, however, have "dual-enrollment" arrangements for high-performing students who exhaust their high school's academic offerings and are allowed to enroll in college courses, but such arrangements are generally distinct from articulation because the students are actually enrolled in a college course on campus.

The advantage of program-to-program articulation over course-to-course articulation is that it underscores the importance of taking the appropriate academic classes and achieving the required academic skills to succeed in the postsecondary program. During our evaluation site visits, both high school and community college representatives often noted that students may succeed in their vocational course sequence in high school, but without parallel success in their academic classes (math and English classes, in particular), they are likely to run into problems in the college-level career program.

b. Emphasis Is Most Often on Short-Term Task of Defining Conditions for College Credit

The most common objective of articulation is to define the conditions under which high school students can earn college credit (Figure III.3). Site visits suggest that the articulation agreement

FIGURE III.3
EXTENT AND SCOPE OF ARTICULATION AGREEMENTS



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

resulting from this review typically specifies what evidence of satisfactory performance in the high school course sequence is required to earn college credit. The standard may be achieving a particular grade in the course, on a final exam, or on a placement or competency test administered by the college. There are instances, however, in which the aim of articulation is primarily to eliminate overlap between courses given in high school and college and, thus, to engage students in more advanced courses at the college level. Among the in-depth study sites, the consortia in Logan, West Virginia, and Dayton, Ohio, followed this approach.

West Virginia and Ohio Consortia Stress Articulation for Advanced Courses, Not Credit

In the Logan consortium, high school and community college faculty jointly developed new sequences of technical courses at the high school and college level in electrical engineering technology and environmental technology. Since the new sequences were designed to avoid redundancy rather than to identify it, there was no need to identify course equivalents or define how students would receive college credit for high school courses. Similarly, at Sinclair Community College in the Dayton consortium, emphasis is placed on having students start with higher-level courses and on developing new, more advanced technology classes at the college.

In most instances, the collaborative process is completed with agreement on credit transfer conditions. Further meetings between secondary and postsecondary faculty are rarely systematic or regularly scheduled, if they are held at all. Notable exceptions exist, however, including the Salem consortium among the in-depth evaluation sites, where articulation is seen as an ongoing collaboration rather than a short-term set of meetings that culminate in a signed agreement.

Oregon Consortium Makes Articulation a Sustained Collaboration

In the Salem consortium, in more than 20 occupation and career areas based at Chemeketa Community College, design teams of college and secondary faculty were formed (sometimes including both vocational and academic teachers). They meet regularly and play an ongoing role in reviewing articulation agreements, shaping curriculum, and promoting and organizing staff development for faculty.

3. Despite the Opportunity, Few Tech-Prep Students Receive Articulated College Credit

To the extent that high school students have some impression of what Tech-Prep is, they most often identify it as a chance to earn college credit in high school. In many consortia, Tech-Prep is not implemented as an identifiable program (see Chapter IV). Even where it is not, however, schools and colleges typically are engaged in at least the course-to-course form of articulation, and promotion of Tech-Prep often highlights articulation.

Many students, however, have a confused idea of what articulation means. Site visit focus groups suggest that high school students, even when they identify Tech-Prep as a "chance to earn college credit," often fail to appreciate that, as a result, they might shorten the time and the money they spend on college. They often have no idea of the pertinent restrictions and requirements (for example, that the articulated course they are taking can earn them credit only at a particular community college).[9]

Relatively few students in Tech-Prep actually receive college credit for high school courses. Although no systematic data exist for nationally representative samples of Tech-Prep students, the follow-up survey of identified Tech-Prep students in selected in-depth evaluation site schools, and site visits throughout their consortia, suggest a pattern that we believe is common elsewhere as well. Across the surveyed schools, only 15 percent of the students identified as 11th-grade Tech-Prep participants in fall 1993 reported in the follow-up survey 18 months later that they had earned college credit in high school and entered a postsecondary program where those credits were actually awarded. In some unusual consortia, as noted earlier, the articulation process does not even provide for earning college credit. More often, however, the low rate at which Tech-Prep participants

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[9]In some states, such as Florida, articulated credits can be applied toward a particular career program at any of the state's community colleges; in most states, however, articulation agreements pertain to the particular local area college or colleges.

actually receive articulated college credit reflects four factors: (1) lack of systematic promotion, (2) procedural hurdles, (3) the overall definition of Tech-Prep, and (4) students' own performance and preferences.

a. More Systematic Promotion Is Needed if Articulation Is to Be Used Widely

Schools often fail to give students clear and timely information about how to receive credit for articulated courses. Many consortia have developed brochures about Tech-Prep, and they often highlight options for earning college credit; in many schools, however, there is little ongoing effort to remind students of what they must do to receive college credit. Because of turnover among school-level Tech-Prep liaisons and the faculty who teach articulated classes, some teachers are unaware that their classes are articulated.[10] Consortium coordinators report that individual teachers are often reluctant to encourage students to seek articulated credits even when they have met defined requirements; some teachers appear to lack confidence that their courses are really equivalent to what comparable courses at the college level demand of students.

b. Procedural Hurdles at the College Level Can Impede Award of Credits

Many colleges insist on procedures for award of articulated credit that can contribute to a low take-up rate. Few community colleges make it easy for students to receive articulated credit. In most consortia we examined in depth, community colleges require students to apply for credits, even if they have already met the course grade or exam requirements to receive credit. This occurs primarily because most community colleges have no systematic way of identifying Tech-Prep participants among their applicants. Exceptions do exist: for example, Capital Community

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[10]One high school in an in-depth study consortium, recognizing this problem, arranged for signs about articulation options to be placed in classrooms where articulated courses are taught.

Technical College in Hartford and Chemeketa Community College in Salem formally enroll high school students who take articulated classes, establish a transcript record for them, and enter their credit when the high school reports successful completion of the course.

c. Programs with a Defined Participant Group Are in the Best Position to Promote Articulation

The form of the Tech-Prep program can affect how common it is for students to obtain articulated credits.[11] Where Tech-Prep aims primarily to make applied curricula or articulation broadly available but does not require any specific choice or application to "the Tech-Prep program," no natural channel exists for clear communication to students about articulation. Instead of having a coordinator who communicates intensively with a select group of students, schools are likely to depend on all teachers of articulated courses to spread the word. This latter strategy, as noted earlier, is more prone to breakdowns in communication to students about articulation options.

Where Tech-Prep is a coherent program of study for a specific group of students who choose it, articulation agreements are more likely to be effective. For example, there can be constant emphasis on the continuity between the high school and college stages. In such programs, Tech-Prep students can receive more encouragement and incentive to enroll at the community college. The Dayton consortium is a good example; Tech-Prep programs there involve close ongoing collaboration between the high school and college faculty, who together make it clear that they expect students to continue to the college stage of the program. In addition, students are grouped together for both vocational and academic classes, and the program promotes a strong sense of identification among those selected for the program. A generous scholarship program for Tech-Prep students who choose Sinclair Community College also encourages matriculation. As a result, they

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[11]See Chapter IV for a discussion of the forms of Tech-Prep implementation.

are more likely to enroll and report receiving articulated credit at a higher rate (over 50 percent) than students in any other in-depth evaluation site.

d. Students' Choices and Performance Affect Likelihood of Receiving Credits

Tech-Prep consortia focus their articulation efforts on creating options for students to earn credit at local institutions, usually one or more local community colleges. Students' interests in postsecondary paths are considerably more diverse, however. In most in-depth study sites, focus groups with students made it clear that those who participate in Tech-Prep rarely have a firm intention to attend the community college where credits they might earn in high school can be awarded.

Discussions with students and staff also revealed that some students who have satisfied requirements for college credits intentionally refrain from requesting them. They may feel that they have not mastered the required skills, or they may prefer to ease their first-year workload by taking courses that repeat material already encountered in high school.

Finally, waiting lists for some postsecondary programs can create obstacles to receipt of articulated credit. This problem has been most often noted in health occupations; at most community colleges, there is more demand for admission to such programs than capacity. In such situations, recent high school graduates are competing with older applicants, who are favored by some colleges because of their maturity and experience. Therefore, Tech-Prep students may find it difficult to gain admission to a program that represents an articulated continuation for them.

D. OPPORTUNITIES FOR WORKPLACE LEARNING

Although not identified in the authorizing legislation as a key program component, workplace learning has received increasing emphasis in Tech-Prep, for several reasons. Debate over the

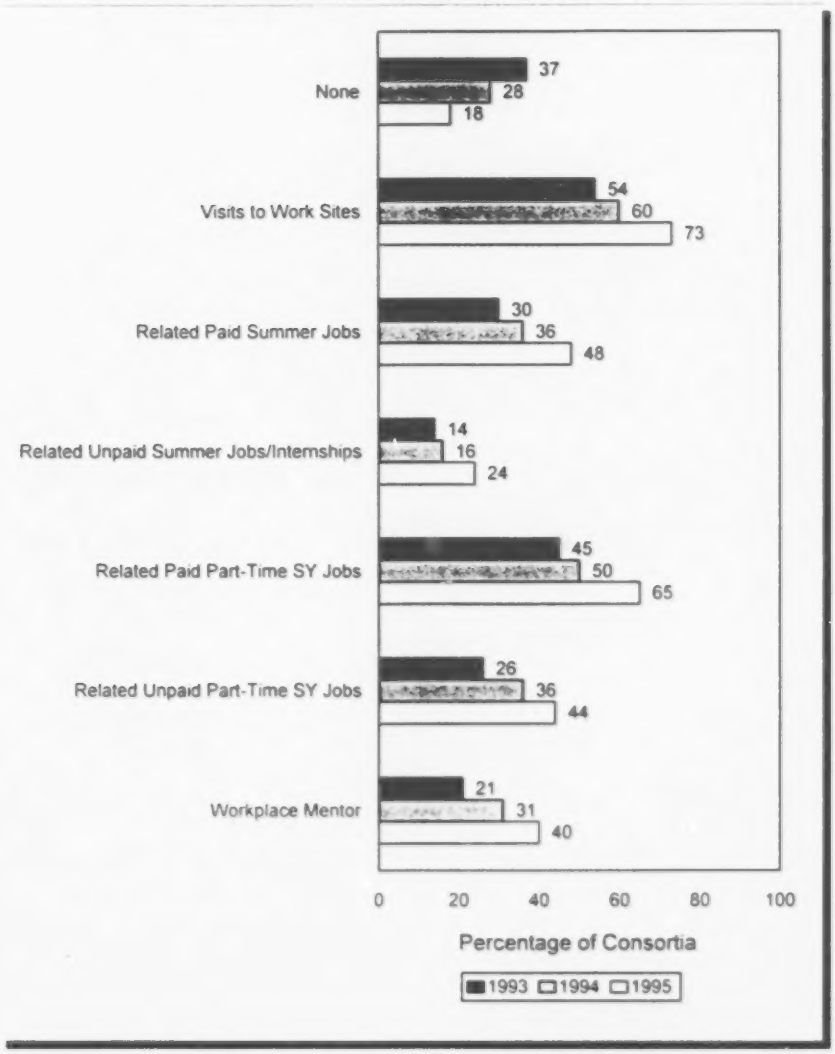
School-to-Work Opportunities Act (STWOA) began when most Tech-Prep consortia were still in their formative or early implementation stages. The prospect of additional resources contingent on plans for student workplace activity led some consortia, particularly those that also serve as School-to-Work (STW) partnerships, to broaden their mission (or at least their description of it) to place greater emphasis on workplace experiences. Some educators in local consortium communities now see a workplace component as a logical extension of the overall Tech-Prep strategy, at least for some students. In some consortia, workplace learning is viewed as an important way to involve local employers in providing worksite internships and jobs and in helping to specify the structure, curriculum, and target skills for Tech-Prep programs that link a workplace component to the school curriculum.

As a result, there has been a steady increase in the percentage of Tech-Prep consortia where students who participate in Tech-Prep (and, often, high school students in general) have access to workplace learning opportunities (Figure III.4). In both 1994 and 1995, there were increases in the proportion of consortia where at least some schools offered worksite visits, paid or unpaid summer and school-year jobs related to students' occupational programs, and assignment to workplace mentors. This trend reflects proliferation both of efforts to create workplace activities for targeted groups of students, like those in Tech-Prep, and of initiatives open to the general student population.

The workplace learning options open to Tech-Prep participants are clearly the result, not only of Tech-Prep implementation, but also of preexisting programs and initiatives supported by recent STW grants. In many schools we visited for the in-depth evaluation, chances for workplace experiences occur largely in existing cooperative education programs, worksite practical experience long incorporated into specific vocational programs, and more recent job shadowing and internship opportunities stimulated by creation of STW partnerships. Given the considerable variation in how

FIGURE III.4

AVAILABILITY OF DIFFERENT TYPES OF WORKPLACE EXPERIENCES TO TECH-PREP STUDENTS, BY SURVEY YEAR



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995

consortia and schools have interpreted the Tech-Prep concept (see Chapter IV) and defined what participation in Tech-Prep means (see Chapter V), it is natural that local Tech-Prep implementation efforts give different levels of prominence to these different forms of workplace activity.

Three main points emerge from our examination of workplace activities as a Tech-Prep component:

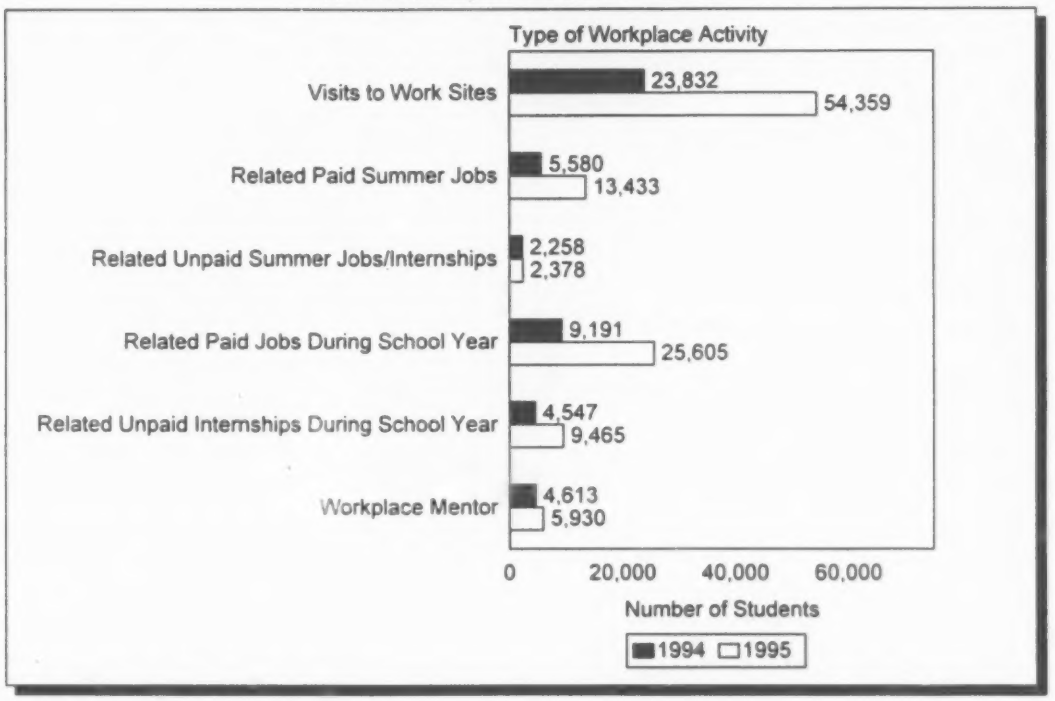
- Despite the increasing availability of workplace activities in general, there is little evidence that participation in such activities is growing specifically among the students identified as Tech-Prep participants.
- Structured programs developed under the umbrella of Tech-Prep--usually labeled youth apprenticeships or career academies--have created intensive workplace learning opportunities as an integral part of some Tech-Prep students' experience, but the scale of these programs is small.
- Aside from these relatively unusual programs, Tech-Prep seldom focuses on a student population that matches the target groups for other workplace activity programs.

1. Rate of Workplace Activity Among Tech-Prep Students Remains Roughly Constant

Despite widespread interest throughout the country in developing more opportunities for students at employer workplaces, we found no evidence that Tech-Prep students as an identified group are participating in workplace learning at an increasing rate. To be sure, as the number of consortia has grown, the *number* of Tech-Prep students involved in worksite visits, jobs, and internships has grown (Figure III.5). For example, the number of students considered Tech-Prep participants who had paid school-year jobs grew from just over 9,000 in school year 1993-1994 to more than 25,000 the next year.

Despite this growth in the overall scale of Tech-Prep and workplace activities it includes, the *percentage* of Tech-Prep participants who engage in the workplace activities does not appear to be growing sharply. In the 1994 and 1995 consortium surveys, for example, consortia reported 14.0

FIGURE III.5
NUMBER OF TECH-PREP STUDENTS PARTICIPATING IN SPECIFIED WORKPLACE ACTIVITIES, BY SURVEY YEAR



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

and 13.9 percent of Tech-Prep students, respectively, as participants in worksite visits(Figure III.6).[12] Rates of reported participation in some workplace activities increased slightly, but others declined. It is not clear, at least in this short period, that consortia or schools with established Tech-Prep initiatives are greatly expanding their emphasis on increasing the rate at which Tech-Prep students participate in workplace learning.[13]

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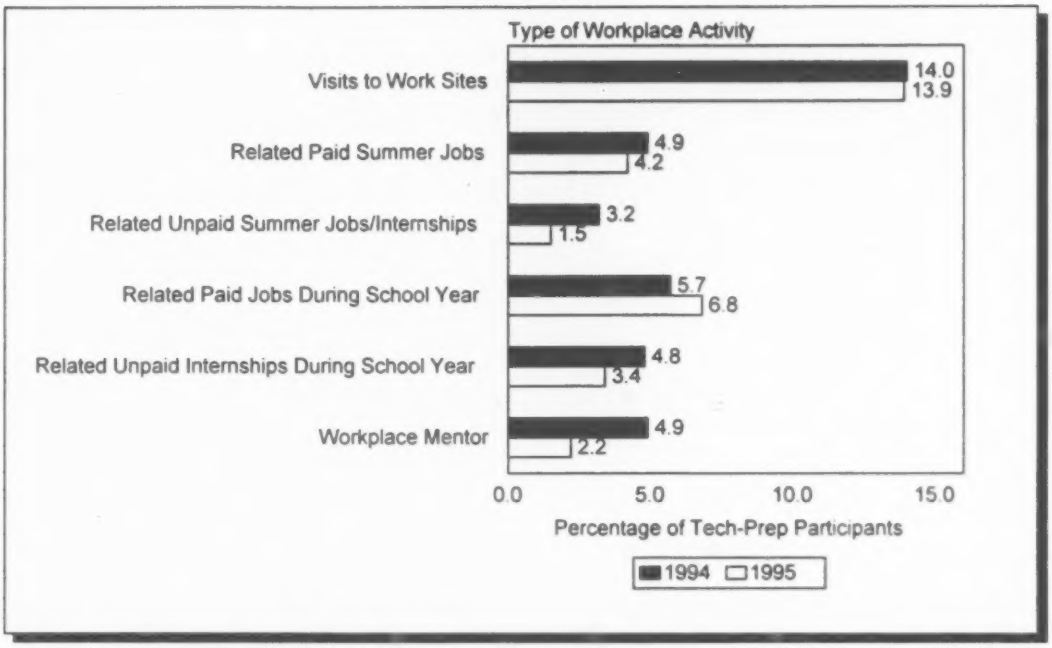
[12]The first consortium survey, covering school year 1992-1993, did not request data on participation of Tech-Prep students in workplace activities.

[13]The apparent anomaly--growth in the number of workplace participants, but no growth in participation rates--occurs because the later survey includes more consortia and, thus, more Tech-Prep students.

FIGURE III.6
PERCENTAGE OF TECH-PREP PARTICIPANTS IN SPECIFIED WORKPLACE ACTIVITIES, BY SURVEY YEAR



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

2. Intensive Workplace Activity Is Included in Structured Programs on a Limited Scale

Some consortia and schools have developed structured, coherent programs of study, either as one component of their Tech-Prep implementation strategy or as its entire focus. In a few cases, these programs have incorporated a strong emphasis on workplace activity. Some of these programs are simply called Tech-Prep; where they form only part of a larger strategy, however, they may be given names such as career academies or youth apprenticeships. Table III.3 provides thumbnail sketches of three such intensive programs at in-depth evaluation sites.

Highly structured programs, such as these, face constraints that appear to prevent substantial expansion of student workplace activity:

TABLE III.3

HIGHLY STRUCTURED TECH-PREP PROGRAMS WITH WORKPLACE ACTIVITY

Youth Apprenticeship Puts Some Tech-Prep Students in Intensive Workplace Component
At the three high schools in the Springdale consortium in Arkansas, youth apprenticeship programs provide paid part-time jobs to students in health occupations, banking and finance, manufacturing, and computer information systems programs. Students must be taking a related vocational course and be following a Career Action Plan that specifies their career goal, vocational sequence, and academic courses. In the third year of efforts to develop these programs, fewer than 50 students (mostly high school seniors) participated, out of more than 300 seniors considered Tech-Prep participants. Little further growth is anticipated.
Health Academy Includes Strategy for Progressively More Intensive Workplace Activity
The Alachua County Schools in Gainesville, Florida have developed magnet academy programs in health professions, finance, entrepreneurship, and criminal justice. In the most developed of these, the Institute for Health Professions, participants are grouped together in ninth grade for math and medical terminology classes, and in grades 10 to 12 for an occupational class, math, and science. In 9th and 10th grades, they are encouraged and helped to find volunteer work in hospitals, clinics, shelters, and other facilities. In 11th grade, students do clinical rotations in places such as hospitals, rehabilitation centers, nursing homes, and schools for physically impaired children. In 12th grade, students have the option of a paid job or taking a vocational dual-enrollment course at the community college.
Workforce Preparation Initiative Gives Select Group a Workplace Experience
In the Illinois consortium centered in East Peoria, four high schools, the community college, and a major heavy equipment manufacturer collaborated to give a small group of juniors and seniors an intensive experience at the workplace linked with workplace readiness classes. Juniors were selected on the basis of application letters, school records, personality tests, an employer test, and an interview with the employer and a teacher. In its first year, 20 juniors were selected and spent half of every school day for nine weeks of the second semester in worksite classes on communication, teamwork, statistics, machine tools, and computer controlled manufacturing--orientation classes comparable to those provided all new employees. For the next nine weeks, they were placed in half-day paid work experience positions.

- ***Employer Constraints.*** Participating employers generally have wanted to screen potential candidates and select students with the best attendance, motivation, and maturity. Most employers can accommodate only a few students; when business slumps, some cut back on earlier commitments.

- ***Student Constraints.*** Workplace components of such programs--such as internships or after-school work experience--compete with students' electives, courses required for college admission, after-school jobs and extracurricular activities. Many students are hesitant to make the kind of multiyear commitment some such programs demand. Some cannot provide their own transportation to worksites.

- ***School Constraints.*** Recruiting employers, coordinating preparation of detailed worksite plans, monitoring student worksite activity, and ensuring appropriate transportation are extremely labor intensive for school staff. Most consortia and schools lack the resources to build up staff for these functions.

3. Other Workplace Options Are Seldom Targeted Specifically for Tech-Prep Students

In most consortia and schools, programs exist that can link students with workplaces. Most high schools have long-standing cooperative education programs. Job shadowing has become a popular way of exposing students to careers of potential interest to them. Community service programs have been developed in many communities. In most cases, such activities are open to students who participate in Tech-Prep, as well as to other students.

Even if progress continues in making such workplace activities more available to students in general, in many communities there may be little effect on the rate at which Tech-Prep participants take part in such activities. These other programs have differently defined target populations: they may involve Tech-Prep participants only coincidentally, and, sometimes there may be no overlap between their target groups. For example, educators generally view cooperative education programs as suited for students in vocational programs, and co-op is used by students in general who wish to substitute off-campus earning time for classroom learning time. Tech-Prep, however, is sometimes

conceived as a special variant of vocational education, in some schools intentionally designed and promoted as distinct from traditional vocational education.[14]

Features of and constraints on cooperative education, moreover, have limited the extent to which it provides opportunities for Tech-Prep students. Cooperative education programs often are administered apart from Tech-Prep, whose leaders typically focus on a separate agenda. They might concentrate on implementing applied academic curricula, defining broader and more challenging technical courses, and forging their own links with employers; rarely, however, do they seek to capture a large share of co-op coordinators' time specifically for Tech-Prep participants. Co-op resources themselves are limited; we repeatedly found schools at in-depth study sites where co-op coordinator positions had been eliminated or cut back, with direct effects on the number of jobs staff could find or properly monitor.

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[14]Given a chance to talk about workplace opportunities for Tech-Prep students, nevertheless, many local Tech-Prep coordinators will mention cooperative education, because some students considered to be in Tech-Prep do take advantage of co-op opportunities.

IV. THE DIVERSE FORMS OF TECH-PREP

Diverse strategies for Tech-Prep implementation have emerged, emphasizing in varied ways the particular elements discussed in Chapter III. Early proponents of Tech-Prep envisioned a program that would involve (1) informed selection of a career focus, with emphasis on technical careers; and (2) completion of a clearly defined sequential program of technical and academic courses extending from high school through two years of postsecondary education. Although implementation efforts have generally been inspired by those broad goals, local Tech-Prep programs interpret them differently. Without prescriptive, specific legislation or strong leadership to encourage program implementation according to a particular model, diversity of Tech-Prep programs is not surprising. Education is largely under local control, terminology in education is rarely defined carefully or understood consistently, local schools face varied internal and external constraints, and the attitudes of students and parents have a powerful effect on how program concepts turn out in actual implementation. We reached three major findings concerning how Tech-Prep is implemented:

KEY POINTS ABOUT IMPLEMENTATION MODELS

Tech-Prep is rarely a structured program in which participants choose a career focus and follow a defined sequence of integrated technical and academic courses in high school and community college. This model--which we found in about 10 percent of consortia--is rare because students, parents, and teachers have reservations about programs that may appear not to lead to a four-year college. Clustering students for academic classes related to their vocational program can help create such coherent programs, but scheduling constraints can make such clustering difficult.

Tech-Prep is most often an enhancement of existing vocational programs. The most common strategy is to train selected teachers in applied approaches to math, science, and English and to encourage vocational students to take these classes. This model accounts for about 50 percent of all Tech-Prep initiatives.

Almost as often, Tech-Prep aims to advance just one ingredient of the original model, without creating an identifiable program for particular students. Some consortia focus on broadening articulation, others on promoting more applied academic instruction. About 40 percent of all Tech-Prep consortia use this approach.

An assessment of the benefits of Tech-Prep, therefore, must clearly acknowledge the substantial differences in what it is. In Section A of this chapter, we distinguish the three broad forms of Tech-Prep implementation observed in the evaluation, representing diverse ways in which schools and consortia have emphasized and combined the program elements described in the previous chapter. In Section B, we describe the factors that have led to this divergence of program forms. In Section C, we present estimates of the prevalence of each of these broad strategies.

A. THREE MAIN FORMS OF TECH-PREP IMPLEMENTATION

Despite variations within consortia and even within schools, we can distinguish three main forms of Tech-Prep implementation:

- Creating structured, comprehensive programs of study focusing on particular careers (Model A)
- Enhancing and supplementing traditional vocational programs (Model B)
- Introducing particular elements of the Tech-Prep concept without targeting particular students (Model C)

It is common, however, to find more than one strategy within a consortium. At the consortium level, coordinators and coordinating committees may agree on what sounds like one of these strategies, but individual schools often deviate either because they face particular constraints or because they have particular opportunities. As a result, in a consortium (and even in a particular school), we sometimes find "embedded strategies"--one general strategy affecting a broad spectrum of students and a second strategy affecting a smaller group of students.

1. Model A: Structured Programs of Study

Some consortia, and some schools, have defined highly structured programs that bring together the different elements of Tech-Prep for a group of participating students. Such programs are found in a variety of circumstances. In some instances, they are the sole definition of what Tech-Prep is supposed to be. For example, in two of the in-depth study sites--the consortia based in Dayton, Ohio, and Logan, West Virginia--the entire focus of Tech-Prep implementation is on particular students who apply to and are accepted for newly created programs and on delivering the academic, vocational, and (sometimes) workplace experiences that make up these programs. In other cases, this approach--which may be labeled as youth apprenticeship or as a career academy--is viewed as part of the overall Tech-Prep initiative for a small group of students, while other students (also considered Tech-Prep participants) are exposed to a more limited version of Tech-Prep. For example, youth apprenticeships are available to a few dozen students in the three high schools in the Arkansas consortium included in the in-depth evaluation. In the same consortium, other changes in curriculum and guidance affect a wider range of students but involve less significant enhancements of their educational program; these are considered the basic Tech-Prep initiative.

The major features of the structured program of study strategy are as follows:

- ***Application and Selection Process.*** Students must choose to enter Tech-Prep and select a particular career focus. They submit an application, which often includes an essay or resume. Particularly when the program prepares students for high-technology occupations, there may be a rigorous selection process, to ensure that students have strong enough skills in mathematics and science. Students are eligible only if they meet criteria, usually based on grade point average and attendance. Sometimes students are interviewed by teachers and collaborating employers, to judge whether they are motivated and have a genuine interest in the particular occupational area as a future career. In some cases, students apply when they enter 11th grade; in others, they apply as early as the start of 9th grade. In most cases, Tech-Prep coordinators (and, sometimes, guidance counselors) actively recruit applicants.

- ***Clear Occupational Focus.*** Consortia and schools may implement multiple programs of study, but each focuses on a particular occupation or set of occupations (such as health occupations, manufacturing technology, business and finance, or environmental technology). Particularly at the high school level, programs usually are designed to give students a technical and academic background for a career area broader than traditional vocational programs provide.

- ***Comprehensive Program of Study.*** Students entering Tech-Prep agree to pursue a defined sequence of both technical and academic courses through their high school years. The program of study most often includes mathematics, science, and English/communications.[1] It identifies the particular occupational program or programs at the postsecondary level to which students are expected to continue. In some programs, workplace internships are specified. In most examples of even these highly structured programs, however, the workplace activity has been made available only to some participants, due to employer selectivity and students' preferences.

- ***Clustering of Students.*** Implementation of this model most often entails grouping Tech-Prep participants with the same career focus together in their technical courses and in at least some of their academic classes. This clustering is intended to create opportunities for integrating academic and technical curricula, for team teaching and integrated projects involving both academic and vocational teachers, and for focused discussion of postsecondary pathways.

The "structured program of study" form of Tech-Prep has important benefits that set it apart from the other, more diffuse approaches to implementation. By stressing selectivity and the postsecondary stage for which students will prepare, organizers of these programs set a high standard for admission and achievement. The programs usually are developed by secondary and community college educators working closely together, which enhances chances for a seamless curriculum sequence and a ratcheting up of the skill objectives at the postsecondary level. Clustering students with the same interests can engender a sense of special identity, pride, and seriousness of purpose in those students, according to local coordinators. Creating a close-knit student group that receives continual attention from a core group of high school and community college faculty can enhance

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[1]Students also must satisfy graduation requirements in social studies and sometimes have room in their schedules for some electives.

chances for transition into the postsecondary stage of the program. These programs often are conceived and planned with strong support from relevant local employers, which usually helps strengthen the public image of the program and sometimes makes it possible to create related workplace opportunities. Structured programs of study maximize chances for substantive integration of technical and related academic instruction, since students are grouped together for key classes.

Efforts to implement structured programs of study often face challenges, however, that have so far kept such programs small. Recruiting interested and committed students is often difficult, for several reasons. The very selection standards that lend prestige to such programs also limit the number of participants. Program coordinators and counselors are sometimes tempted to bend admission standards, but doing so risks admitting students with weaker academic preparation or only casual interest in the career area. Students--with concurrence from their parents--often are reluctant to commit themselves to a career-focused comprehensive program of study, sometimes because they may not believe it can lead to a four-year college degree.

The structured program of study is more likely than other approaches to promote continuation to the postsecondary stage of Tech-Prep, but even under this model some factors can interfere with the transition to the partner community college.[2] For example, if standards for admission into the high school phase of the program are relaxed, students may fail to measure up to the standards set for the college phase of the program. Where standards are observed scrupulously, these Tech-Prep programs tend to include a substantial proportion of students who plan to go to four-year college programs and who opt not to attend the community college stage of the program. Although Tech-Prep may provide these students with a positive experience, low rates of continuation to the

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[2]See Chapter VI for an estimate of the rates at which Tech-Prep students go on to the postsecondary level of the program.

community college stage of the program can undermine efforts at such colleges to implement advanced-skill courses designed to build on the high school portion of the program. Consortia and their members can make special efforts designed to mitigate this risk, including activities held on the college campus for Tech-Prep high school students, and greater emphasis on how the community college stage of the program can provide a strong (and relatively inexpensive) foundation for further education at the baccalaureate level.

Implementing structured programs of study requires overcoming scheduling problems that can interfere with the aim of clustering students together in core classes. Clustering students--for example, putting all engineering technology students in a particular math class--is sometimes difficult because individual students may want to take other classes that meet at the same time as the cluster classes. This is particularly true when the program succeeds in attracting students with strong academic performance, whose choices include advanced classes with few sections. If an academic class (for example, Applied Chemistry) originally slated for clustering cannot attract enough program participants, it may be canceled; program students then take the particular subject with other students. Another option is to open the cluster class to nonprogram students or to Tech-Prep students in programs with a quite different occupational focus (for example, running a Technical Math class for students from all vocational programs). This strategy may preserve the class but frustrate intentions to integrate the academic curriculum closely with the program's career focus and technical curriculum. Sometimes, the result is that the original vision of a highly structured program is eroded, and Tech-Prep may end up resembling less intensive models.

The challenges of implementing structured programs of study can be surmounted, however. Increasing numbers of schools offer youth apprenticeship and career academy programs, educational strategies with core elements similar to those of Model A Tech-Prep programs. Although

developing these comprehensive programs requires careful planning and sustained commitment, the potential benefits to students are clearly motivating more educators and their community partners to pursue this approach. Some of these efforts are being carried out with Tech-Prep leadership or resources, which suggests that the more intensive form of Tech-Prep (however labeled) is possible, and even attractive, in some communities.

2. Model B: Enhanced Vocational Programs

Existing vocational programs have been a natural starting point for implementing Tech-Prep in most consortia, for several reasons. Tech-Prep originated in vocational education legislation, and the program concept focuses on preparation for careers. In many consortia, Tech-Prep coordinators are drawn at both the secondary and postsecondary level from staff already responsible for occupational programs. Such staff members readily acknowledge and identify ways in which their programs could be improved and prospects for better outcomes among their target population strengthened.

Tech-Prep strategies that build directly on existing vocational programs have been shaped by widespread perception of three issues affecting success among students who take vocational program sequences.[3] First, almost every educator we encountered is concerned about weak achievement in mathematics, science, and English among vocational program students. Second, educators in some schools are concerned about whether their vocational courses are providing up-to-date technology and instruction. Third, there is widespread recognition that students in this target group (as well as students in general) often fail to plan their studies based on at least a tentative goal for education or employment after high school.

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[3]These perceptions concern students who are likely to take a series of vocational courses, rather than all students who take any vocational course; the latter group includes most high school students with all levels of academic performance.

Because of these perceptions, many local Tech-Prep leaders have used an implementation strategy that has the following three main features:

- ***Focus on Students in Vocational Programs.*** Many consortia and member schools see Tech-Prep as a way to improve success among all or most vocational program students, not just the most highly motivated ones with at least moderate academic success (as is more typically the case in comprehensive, structured programs of study).

- ***Applied Academic Classes for Vocational Students in General.*** As in the structured programs of study model, schools train teachers in applied instructional methods and often have acquired curriculum packages. However, instead of concentrating on clustering particular students--those in the Tech-Prep vocational program or programs--into applied academic classes by career interest, these schools usually make the applied classes available to all vocational program students.[4] The applied classes are viewed as a way to make academic curriculum more suitable for the students' learning styles and thus to help them achieve at a higher level. In this model, there is typically little effort or success at grouping students from the same or closely related vocational programs together in particular academic classes.

- ***Helping Students Choose Appropriate Academic Classes.*** Instead of expecting students to commit to a prescribed program of study, many consortia and schools define "core sequences" that are suggested for students who choose particular vocational programs or have a specific career interest. These core sequences typically are provided as a resource to guidance counselors to use in their discussions with students as they choose courses for the next year, but there may be little emphasis on getting students to see an overall sequence of high school and community college courses as the "program" they are choosing. Instead, emphasis is placed more on informing counselors, so they can advise students about "the right classes" given their broad career interests.

Other features are sometimes present, although they seem less central to the Tech-Prep initiative and are more connected to ongoing efforts to improve vocational programs. In some sites where Tech-Prep is basically an enhancement of vocational programs, there are clear efforts to strengthen vocational curriculum. For example, machine tool shops may be replaced entirely or refitted to refocus the curriculum on integrated computer-controlled manufacturing processes.

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[4]In fact, as explained in Chapter VI, many schools and consortia define a Tech-Prep student as one who is taking a vocational program and at least one math, science, or English class that is labeled "applied."

In some schools, this Tech-Prep model includes an effort to give students more time and information before they choose a vocational program. Particularly where Tech-Prep begins in a vocational high school, vocational division, or area technical center, students traditionally have chosen a vocational program early (often at the end of 10th grade and sometimes in the middle of 9th grade) based on very little knowledge of what awaits them. In most places, students make this choice after an exploratory period--usually one semester--during which they rotate at several-week intervals through all (or their choice of some) of the available vocational classes and receive a brief introduction to the curriculum, equipment, and environment of each. Educators find, however, that students often pick their program based on where their friends will be or on their immediate personal interests (for example, cars or cosmetics), rather than on what might suit them as an occupation. In some schools we have been following, steps have been taken to lengthen exploratory periods, to give students more time to experience a few possible choices.

In this form of Tech-Prep, as in Model A, efforts sometimes are made to increase cooperation between academic and vocational teachers. Such efforts are feasible where students attend full-day vocational schools that include academic classes or where vocational courses are taught at comprehensive high schools. In such settings, some schools seek to increase communication between vocational and academic teachers and encourage them to use each other's classes as springboards for their own instruction. In one Massachusetts school, for example, a vocational instructor who teaches integrated manufacturing has his students take the machined metal objects they produce into their geometry classes, where the teacher uses them as a basis for an exercise in calculating the volume of irregular objects.

Some features of this implementation model make it easier to implement than Model A. Compared to the structured program of study model, the Model B approach expects less of a

commitment from students and leaves their course selection more open to variation. For academic subjects, students typically are guided toward those classes for which applied curriculum has been introduced; however, they are allowed to take others (for example, a higher-level math class) if they prefer and appear capable of doing so. Encouraging vocational students to take new applied classes presents less of a scheduling challenge than trying to cluster students in academic classes by occupational program.

Because of its broader base and flexibility, however, this model also has clear drawbacks. Unlike the structured programs of study, this approach rarely makes students feel that they are in a new, rigorous program in which they must measure up to higher standards. Although many consortia following this strategy expend great effort on marketing Tech-Prep, we have seen little evidence in focus groups that students view it as more than traditional vocational education. Emphasizing applied academic classes for vocational students in general may make learning more "hands-on," but without clustering by vocational interest it may add little chance for close linkages between technical and academic instruction. Since the number of applied classes needed to serve all vocational students may be substantial, this model could engage a broad range of teachers; in practice, however, it sometimes faces difficulty gaining wide support among teachers. Applied classes often are seen as targeted to students with academic difficulties, and many experienced teachers prefer not to teach such classes. In most schools we visited, we did find a few seasoned, expert teachers who spearheaded the introduction of applied academics. However, the broader the group of teachers involved, the more difficult it was to retain the principles of applied instruction in the classroom.

3. Model C: Introduction of Tech-Prep Elements Without Targeting Specific Students

Although those who originally conceived Tech-Prep saw it as targeting students in the middle range of school performance, many educators have found in it ideas that they view as important for most or all students. Many Tech-Prep proponents see the ideas behind applied instruction as relevant for even the most capable students: tying mathematics, science, and English to the "real world," involving students more actively in the classroom, and having students analyze and solve problems to reinforce traditional theoretical concepts. Similarly, many Tech-Prep leaders at the local level believe all students should develop a plan for their studies that reflects a goal for postsecondary education, training, or employment. We repeatedly encountered educators who reported that their own children might have benefited from the Tech-Prep emphasis on planning one's studies; they describe youth who are pursuing or have even completed a bachelor's degree but still have little idea of what they are preparing themselves for and no sense of what marketable career skills they might have developed. At the federal level, individual Department of Education staff members have come to believe that Tech-Prep is for all students, although no formal policy reflecting this view has been established.

In some consortia and some schools, Tech-Prep implementation efforts seem to reflect such views, in that they consist of specific educational changes broadly intended to affect students in general. Where this approach is taken, students are usually barely familiar with the term "Tech-Prep" or see it simply as a term used to distinguish between students going to four-year colleges and others who might attend a community college. This diffuse implementation approach may have one or more of the following features, implemented as parallel efforts rather than as part of a concerted program initiative affecting particular students:

- ***Untargeted Introduction of Applied Academics.*** Many educators feel that making academic classes more applied is the point of Tech-Prep, even if the affected classes are not part of a program of study for particular students. In some schools, broad-based efforts are made to introduce teachers to concepts of applied instruction. Such efforts may be an important element in trying to abolish the "general track" of academic instruction, widely viewed as allowing students to satisfy graduation requirements through a sequence of low-level classes. These efforts may rely on the purchase of commercially available curriculum packages for use in a few classes or on a general program of professional development designed to introduce many teachers to concepts of contextual, hands-on learning.

- ***Emphasis on Career Guidance and Purposeful Course Selection.*** Particularly where counseling staff take the lead in local Tech-Prep implementation, the initiative may focus on getting all students to form a career goal, understand the educational path required to achieve it, and choose their high school courses and other experiences to prepare them for that path. Career resource centers are created or enhanced. Greater emphasis may be placed on getting all students to explore their interests in middle school and early high school years using career interest inventories. Students may be required to lay out a plan for their studies and review it each year with a counselor. Counselors themselves may be encouraged through training and externships at employer worksites to become more familiar with career opportunities for students and to help them consider their career options as they plan their studies.

- ***Focus on Articulation.*** In Model C, the main implementation priority is often increasing the number of articulation agreements under which college credit can be awarded for specific high school vocational courses. (In contrast, articulation in Model A is more likely to involve alignment of the combined academic and vocational program, and sometimes may not even provide for awarding early college credit.)

This "diffuse reform" approach to Tech-Prep implies the least disruption and change. Different groups within a school can pursue it independently: the math, science, and English departments perhaps updating their curriculum, the guidance office perhaps stressing more career development activity. Since this form of Tech-Prep has no target population, it is least likely to raise concerns among parents about tracking.

The biggest drawback of this approach is that it may have little effect on the experiences of individual students. Most consortia or schools that rely on this approach choose one or two components to emphasize that educators believe are important in the long run. Their efforts to

introduce the changes, however, often are spread thinly across many teachers and students. Some components--such as articulation or some classes with applied instruction--may be developed and made available, in theory, to all students, but relatively few students actually experience them. For individual students, the net effect of the Tech-Prep initiative on their school experience is often hard to distinguish.

B. WHY TECH-PREP TAKES DIVERSE FORMS

The three forms of Tech-Prep implementation discussed in the previous section are broad ones into which we have classified complex sets of local decisions and activity. We do not mean to imply that all Tech-Prep leaders consciously choose among these three strategies as we describe them. Some may have made explicit decisions to pursue a particular Tech-Prep implementation approach that is consistent with one of the models described here. However, in many cases, these implementation variants are the result of original plans and their encounters with the challenges just described. These factors frequently make Tech-Prep different from the way it may have originally been described or envisioned at the local level. Practical factors thus play as much a role as differences of intent. Four key factors help explain why consortia and individual schools follow diverse implementation paths:

- Misperceptions of options for students in programs of study
- Characteristics of and relationships between consortium schools and colleges
- Modest resources available for planning and coordinating Tech-Prep reforms
- Direction and specificity of state models guiding Tech-Prep implementation

1. Misunderstanding of Career Options for Students in Programs of Study

The early premise of Tech-Prep held that students will make a choice that has real consequences for the educational path they follow over several years. They would choose a defined program of vocational and academic courses extending from midway through high school through two years of postsecondary study. To some extent, the early Tech-Prep model emulated European education systems, in which students at a comparable age traditionally have chosen either a university preparation program or a technical program focusing on a particular occupational area.

In many communities, students, parents, and educators have not clearly understood the implications of this approach. Incomplete success in conveying the benefits of a coherent program of study and the range of options available to students who follow one has left many among these three key audiences cool to the idea. Their continuing reluctance takes three forms that consortia have not fully overcome:

- ***Reluctance About Choosing a Career Focus.*** On the basis of site visit discussions, it appears that many parents and educators believe that choosing a career focus in their mid-teens limits students' chances of pursuing another career. Many believe that in late 9th grade or in 10th grade--when choices typically must be made where programs of study exist--students are not prepared to make decisions affecting their future careers and should not be expected to. Predictions that youth must be prepared for a life of multiple careers have encouraged some educators to view occupational focus as contrary to the aim of developing generalizable skills. To overcome this concern, consortia must communicate more clearly that programs of study can motivate students to master basic academic and problem-solving skills that will be important in any career path.

- ***Nearly Universal Focus on Baccalaureate Degrees.*** Almost all parents want their children to go to a four-year college, and even students with weak academic performance routinely assert that they will. Despite high rates of actual enrollment in community colleges, parents are still skeptical of high school-level programs that they suspect might weaken their children's prospects for a bachelor's degree. This concern could be addressed by clearer information on actual completion rates in baccalaureate education, better information for parents about relative costs in community colleges and four-year institutions, and expanded options for transferring from community colleges to four-year colleges.

- ***Suspicions of Tracking.*** Programs associated with vocational education still elicit concerns among many parents that their children are being shunted into an educational path that will not lead to rewarding, high-status career options. Tech-Prep programs of study, even when built around new high-technology courses, are still often associated with traditional vocational education and what many still perceive as blue-collar work. To address this concern, schools and consortium leaders will have to continue efforts to clarify the kinds of high-demand occupations (and incomes) available to graduates of career-focused community college programs.

Concerns about tracking and aversion to an occupational focus are factors primarily where Tech-Prep is implemented in comprehensive high schools. In vocational schools, in contrast, students have already chosen an occupational focus and a vocational program by the time they encounter the changes introduced by Tech-Prep. In vocational schools, however, other factors have stood in the way of implementing Tech-Prep as a comprehensive program of study. Educators at these schools generally view the students' choice of a specific vocational program as most important. Their attention usually focuses on strengthening students' academic performance through more applied instructional approaches available to all their students, rather than on creating more structured programs that integrate vocational and academic courses more closely for students with similar career interests.

2. Institutional Characteristics and Relationships Can Influence Form of Tech-Prep

Consortia and their member communities start from very different points in defining and implementing Tech-Prep. They have different histories of cooperation, varying levels and types of experience with earlier initiatives related to Tech-Prep, and diverse internal challenges as institutions. Several specific factors can affect the direction of Tech-Prep:

- ***History of Secondary/Postsecondary Collaboration.*** Sometimes, long experience working together on articulation has made it unnecessary to continue devoting staff time and other resources to creating the articulation process. Instead, consortia have been

able to focus attention on introduction of applied curriculum approaches or development of structured programs of study.

- ***Staff Turnover.*** Where there is substantial turnover in teaching staff, it is particularly difficult to sustain the close working relationships required to make the integration of academic and vocational curriculum an ongoing practice. Staff turnover at the leadership level can stop Tech-Prep implementation, particularly in small consortia that depend on a few key people. In one in-depth study site, for example, the departure of the coordinator has led to apparent abandonment of the ideas that had formed the core of the Tech-Prep initiative. Turnover can affect progress in all three forms of Tech-Prep.

- ***Transience Among Students.*** Districts that have a high rate of student mobility are unlikely to invest in attempts to create defined programs of study with students clustered in related academic and vocational classes. That form of Tech-Prep is particularly dependent on having a stable group of participants who can proceed together through a planned curriculum sequence.

3. Small Consortium Grants Can Constrain Scope of Tech-Prep Implementation

Tech-Prep grants at the local level have been used to stimulate, guide, and coordinate change. Local consortia typically use their resources to facilitate communication and coordination among members, encourage professional development, develop and monitor articulation agreements, coordinate and encourage curriculum development, and market Tech-Prep concepts. Nearly 60 percent of all consortia rely solely on Title IIIE grants to support such consortiumwide functions, so the scope and intensity of the Tech-Prep agenda are likely to depend heavily on the level of staffing and other functions that these grants can support.

Many consortia are attempting Tech-Prep implementation with modest infusions of new resources. Particularly in some states where Title IIIE funding is widely disbursed to small consortia (for example, to all or most of a state's counties or school districts), average grants are small (Table IV.1). In contrast, other states have been more selective in awarding grants and have concentrated funding in a relatively small set of larger consortia. Although these consortia often include multiple school districts and schools that individually may not receive large amounts of Title

TABLE IV.1

AVERAGE AMOUNT OF TITLE IIIE GRANT, BY CONSORTIUM SIZE

Total Number of Secondary Schools and Postsecondary Institutions in Consortium[a]	Number of Consortia	Average Amount of Most Recent Title IIIE Grant
5 or fewer	176	$51,282
6 to 10	221	$72,624
11 to 25	357	$113,274
26 to 50	121	$159,234
More than 50	20	$238,013
Total	**895**	**$100,148**

[a]Includes regular secondary schools and secondary independent area vocational/technical centers.

III funding directly, they often benefit from coordinated, better-funded efforts spanning the entire consortium in areas such as articulation, teacher training, and employer recruitment.

Limited resources generally narrow the vision of Tech-Prep. Systematic survey data cannot clearly distinguish the effect of funding on implementation models. However, our firsthand experience in the field suggests that, when a localized Tech-Prep effort has limited funding that will not even support a single staff coordinator, ambitions for Tech-Prep usually are modest and unlikely to extend as far as developing structured programs of study. In such situations, Tech-Prep is more likely to focus on helping some teachers make their classes more applied or on maintaining course-to-course articulation.[5] Consortium coordinators consistently identify lack of resources as a problem affecting implementation. In fall 1995, nearly 69 percent cited this problem; the rate was even higher (74 percent) in consortia with grants of less than $50,000.

4. Most Structured Form of Tech-Prep Common Only Where State Mandates It

Every state has issued a formal definition of the goals and features of Tech-Prep, but these definitions often leave considerable room for local interpretation and, thus, latitude in adopting an implementation strategy. In many instances, state requirements simply replicate the succinct federal requirements set forth in Title IIIE that define the local consortium and what constitutes an acceptable Tech-Prep program (see Chapter II). Many states (40) have developed definitions of what it means to participate in Tech-Prep, but fewer (35) require that local consortia adopt the state's definition in their own reporting on Tech-Prep enrollments.

Some states, however, have consciously tried to make Tech-Prep in all consortia into a highly structured, selective program focusing on technical occupations. West Virginia, for example, has

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[5]Some consortia may have small Tech-Prep grants but also benefit from more substantial STW grants, or they may concentrate other Perkins funding on Tech-Prep objectives.

awarded grants to local consortia for specific occupational programs that meet the state's model, instead of simply allowing geographically defined consortia to define Tech-Prep as they wish. In Ohio, Tech-Prep grants were made only where programs that matched the vision of a selective, technology-focused program were feasible and local districts and colleges clearly had the same aim.

Our experience in the in-depth evaluation suggests that implementing the Model A form of Tech-Prep requires strong state support and promotion. Although relatively few examples exist so far, state agencies can set standards that call for this kind of more intensive program and that press local consortia to concentrate their Tech-Prep resources on such programs, even though they may serve a small segment of the student population. Without strong state guidance, local objections of the sort described earlier are likely to make it difficult for consortia to make structured programs of study the cornerstone of Tech-Prep.

C. PREVALENCE OF TECH-PREP MODELS

To characterize the prevalence of the main models of Tech-Prep implementation, we must draw on a combination of field experience and evaluation surveys of consortia. Field experience provides the most detailed understanding of how consortium leaders and individual schools conceive of Tech-Prep and implement it. However, our field experience is limited to the 10 consortia and several dozen schools we visited and similar insights gained from informal encounters with Tech-Prep leaders from states and other sites. The consortium survey included almost all local consortia in the country, but it also has limitations. Coordinators often describe their Tech-Prep implementation based on their concept or vision of Tech-Prep rather than what has been realized. Moreover, some

features that we think distinguish implementation models are difficult to differentiate from data provided in consortium survey responses.[6]

Although a precise measure is not possible, we estimate the following relative prevalence of these three models of Tech-Prep implementation:

- ***Tech-Prep most often takes the form of enhancements to existing vocational education programs (Model B).*** In most consortia, incremental changes specifically affecting students enrolled in existing vocational programs are the most prominent implementation strategy. The two most common enhancements are (1) helping selected teachers adopt more applied approaches to math, English, and science; and (2) providing counselors (and sometimes students) with information on suggested courses (thus guiding students to take the applied courses and other academic classes that are relevant to their career interests). We estimate that Model B implementation accounts for about 50 percent of all consortia and member schools.

- ***The next most common model is the nontargeted introduction of particular elements of Tech-Prep (Model C).*** Consortia and schools often promote particular features such as improved career guidance, course articulation, or general staff development on applied instructional methods, without conceiving of these efforts as creating a coherent program for a particular group of students. We estimate that about 40 percent of consortia and schools have followed this approach.

- ***Least common are highly structured, comprehensive programs of study (Model A).*** These career-focused programs encompassing vocational and academic curriculum, which students consciously choose and apply for, and in which they make at least some commitment to a defined course sequence, are the most complex to implement. We estimate that they account for about 10 percent of Tech-Prep consortia and schools.

These estimates are derived from field observation and from analysis of how consortia say they define what it means to participate in Tech-Prep. These diverse definitions of participation and how they correspond to broad implementation models are examined in the next chapter, as a basis for characterizing the overall level of student participation in Tech-Prep.

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[6]For example, the survey did not collect information about whether the core Tech-Prep program involved clustering of students in academic classes by vocational interest or whether there was an application and selection process. Moreover, the consortium survey captured information about definitions of core Tech-Prep features only when the coordinator indicated that a particular model exists in all member districts and schools; this approach leaves out about 20 percent of all consortia.

V. PARTICIPATION IN TECH-PREP

Tech-Prep was initially conceived as a way to improve the skills and employment preparation of the "middle majority" of American high school students. Tech-Prep was a response to concerns that the broad middle segment of American students--those who would most likely finish high school but not earn four-year college degrees--were receiving too little attention from educators and less than a fair share of educational resources. Early proponents viewed Tech-Prep as a way to strengthen career preparation for these students, who otherwise would be in general or vocational education tracks that often failed to provide them with the academic or technical skills they would need to succeed. Although the legislation did not explicitly target this group, Title IIIE's emphasis on technical preparation and associate degree completion indicates a prevailing interest in this segment of the student population.

In this chapter, we assess the extent to which Tech-Prep serves the middle majority, focusing on the answers to two important questions. First, has Tech-Prep grown to the point where it involves a substantial fraction of students? Second, to what extent does it focus on middle-range students as originally anticipated? Four conclusions emerged from the evaluation pertaining to these questions:

KEY FINDINGS ABOUT PARTICIPATION IN TECH-PREP

Measures of Tech-Prep participation reflect the diversity of implementation models. There is no single definition adopted by states or consortia of what it means to participate in Tech-Prep.

A small, gradually increasing fraction of students participate in Tech-Prep. Using the definitions that consortia themselves have stated, we estimate that, in fall 1995, about eight percent of high school students were participating.

Tech-Prep participants come from the full spectrum of student performance. In general, however, they come from segments of the population with somewhat lower average academic performance than the overall student body.

The widely perceived need for more math and science is being addressed. Impacts on course-taking could not be measured, but Tech-Prep participants in the in-depth study sites took more math and science than is typical of vocational students nationwide.

A. DEFINITIONS AND LEVELS OF TECH-PREP PARTICIPATION

Despite the variety of approaches to implementing Tech-Prep, it is important to have some simple measure of the number of students affected. Implementation progress has qualitative dimensions relating to changes in how schools function, but growth in the number of students participating is also a useful indicator of how fully Tech-Prep has taken hold in American schools. Participation levels are a quantifiable signal of how broadly students are affected by the substantial investments made in the program. The evaluation showed that:

- Tech-Prep participation is defined in many ways.
- Consortia gradually are overcoming early obstacles to reporting on participation, but many remain.
- Tech-Prep participation is growing but still involves far fewer students than a middle majority.
- Tech-Prep students come from a broad range of academic performance and, in some communities, are being pushed to take more math and science than has been typical in the traditional general or vocational tracks.

1. "Participation" in Tech-Prep Measures Diverse Experiences

It is important to estimate levels of participation in Tech-Prep, even though "participation" implies many different types of program experiences. Two factors are responsible for an inevitable lack of precision and clarity in what participation data measure. These factors are (1) the diversity of implementation models, and (2) discrepancies between what consortia actually do and what they are able to report on.

a. Implementation Models Affect What Is Measured

The three implementation models described in Chapter IV shape the way consortia define what it means to be a Tech-Prep participant and our expectations about the reported scale of participation.

For example, where Tech-Prep is strictly defined as a distinct and cohesive program of study (Model A) participation measures will include only those students who take part in a clearly prescribed set of activities. In such sites, one would be able to visit a high school and observe an identifiable group of students engaging together in a clear set of activities in vocational and academic classes and, sometimes, at worksites. Given the model's relative rarity to date (see Chapter IV), we would expect Model A programs to report few participants compared to the other models. Greater appreciation of the benefits of this model and determined efforts to overcome the challenges associated with it probably will expand Model A programs to some degree; however, participation in these focused programs is likely to remain more limited than participation reported in other forms of Tech-Prep.

Where Tech-Prep is implemented in its most common form (the less comprehensive Model B) the experiences of participants may not be so different from those of other students. In this model, vocational students are likely to be labeled Tech-Prep participants simply because they enroll in a single academic class or two that are identified as "applied." In some sites, the vocational students who take applied academic classes are considered Tech-Prep participants only if their vocational program is already covered by an articulation agreement. A visitor to such sites often will find it difficult to recognize who is a Tech-Prep participant, because the applied academic classes are likely to include vocational and some nonvocational students, and students from a variety of articulated and nonarticulated vocational programs.

The Tech-Prep experience is most difficult to distinguish where the form of implementation resembles Model C. In this model, individuals from the general student body (not only those who follow vocational course sequences) may take newly developed academic classes with an applied approach or articulated vocational courses. All students may be able to participate in a career guidance process and career development activities, the main thrust of Tech-Prep in some consortia.

Since each of the three implementation models has variants, the meaning of participation in Tech-Prep is even more diverse. In the annual evaluation surveys, consortia were asked to identify which of five criteria relating to the original model of Tech-Prep they use to determine who is "in Tech-Prep." The criteria posed were whether a student (1) chooses Tech-Prep as a pathway or program, (2) develops an educational plan indicating a course sequence across the secondary and postsecondary levels, (3) takes an articulated (or unarticulated) vocational course, (4) takes an applied academic course, or (5) participates in a work/training experience at a worksite in a position related to a Tech-Prep course or career focus. In 1995, more than 30 combinations of these criteria were used to describe the aspects of students' experiences that would qualify them locally as Tech-Prep participants (Table V.1).[1]

b. Reported Participation May Distort the Significance of Tech-Prep Changes

Pressed by state Tech-Prep coordinators and the U.S. Department of Education (as well as the national evaluation surveys) to provide statistics on participation, local consortia report what is countable. Sometimes, as a result, reported participation may understate or overstate the scope of program change that has resulted from the Tech-Prep consortium's activities. For example, in some schools, the greatest emphasis has been placed on making guidance in postsecondary planning more systematic, adding resources to ensure all students get such guidance, and increasing the attention paid in the guidance process to students who will not attend four-year colleges and may benefit most from education or training in technical fields. In such schools, however, Tech-Prep participation counts may be based only on identification of students who took articulated vocational classes and

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[1]Only consortia with a consortiumwide definition--in which all member districts have adopted the same criteria--were asked to record their specific participation definitions. These accounted for 81 percent of all consortia.

TABLE V.1

DEFINITIONS OF TECH-PREP STUDENT PARTICIPATION

Model	Definition Criteria				
	Chooses Tech-Prep	Student Plan	Vocational Course	Applied Academics	Workplace Experience
Model A: Selective	X	X	X	X	X
Program of Study	X	X	X	X	
Model B: Enhanced			X	X	
Vocational Education	X	X	X		
	X		X	X	
	X		X	X	X
		X	X	X	
		X	X		X
			X	X	X
		X	X	X	X
	X		X	X	X
	X	X	X		
Model C: Nontargeted	X				
Tech-Prep		X			
			X		
				X	
					X
	X	X			
	X		X		
	X			X	
	X				X
		X	X		
		X		X	
		X			X
			X		X
				X	X
	X	X		X	
	X	X			X
	X		X		X
		X		X	X
	X	X		X	X

NOTE: Definitions of participation were reported only by consortia in which all consortium members adopted the definition.

an applied academic class. Such counts can understate the degree to which the broad underlying concerns motivating Tech-Prep have been addressed and the number of students affected in some way.

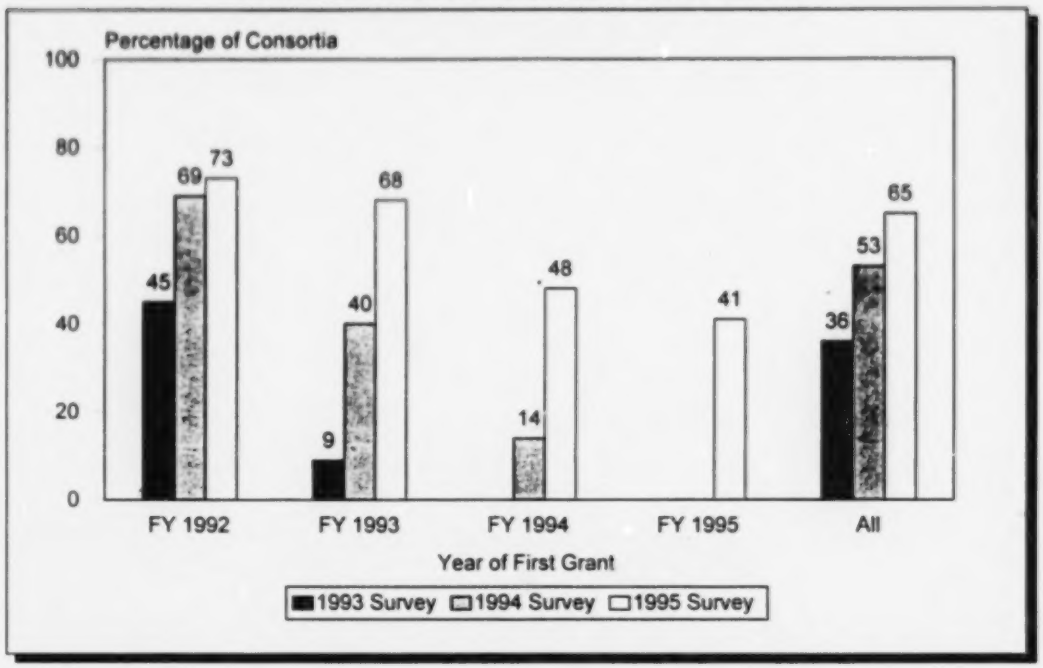
On the other hand, participation measures may sometimes overstate changes associated with Tech-Prep. For example, in about four percent of all consortia, students are considered Tech-Prep participants simply because they have participated in a vocational course or because they take a vocational course and engage in some workplace activity. Such activity could have been observed a decade earlier among students taking vocational courses and holding jobs through cooperative education. Some of these consortia may have tried to improve both kinds of experiences, but our field observation suggests that some consortia are reporting on activities of a sort that predated Tech-Prep and may incorporate little of the high-skill, integrated quality envisioned for Tech-Prep.

2. Many Consortia Continue to Have Difficulty Reporting on Participation

A substantial fraction of Tech-Prep consortia and schools continue to have difficulty providing information about participation, although there is clear improvement. The percentage of consortia that could identify and count Tech-Prep participants grew from 36 percent in 1993 to 65 percent in fall 1995 (Figure V.1). The longer consortia exist, the more likely they can report on participation. For example, of consortia dating back to 1992, about 45 percent could report on participation in the first evaluation survey; by the third survey, 73 percent could. Consortia often are able to report on participation for only some of their member schools, although this issue is gradually being addressed. In 1993, consortia that reported on Tech-Prep participation did so for only 17 percent of their member districts, on average; by 1995, reporting consortia provided participation information for 42 percent of member districts (not shown in figure).

FIGURE V.1

PERCENTAGE OF CONSORTIA THAT REPORTED TECH-PREP PARTICIPATION, BY SURVEY YEAR AND YEAR OF FIRST GRANT



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1993, 1994, 1995.

Difficulty reporting on participation often can be traced to the nature of the implementation model. Where Tech-Prep is a distinct program that students apply for, schools are most likely to be able to identify them (perhaps based on approved application forms) and to have a school-based Tech-Prep coordinator who knows exactly who is participating. At the other extreme, where Tech-Prep is primarily a broad effort to improve career guidance or expand the use of applied instructional approaches, it is difficult to identify which students are participants, except by asserting that all students could be affected.

Practical constraints also limit reporting of participation even when the conceptual definition may be clear. For example, where participation is defined as taking an articulated vocational course and any applied academic class, school records often are not organized or computerized in a way that

allows ready identification. Sometimes consortium coordinators simply do not have enough influence to persuade member districts or schools to overcome such practical problems in the face of other pressing demands deemed more important.[2]

3. Participation Is Increasing But Still Involves a Small Fraction of High School Students

Despite difficulties and ambiguities in defining and reporting participants, Tech-Prep has expanded substantially. The total number of high school students identified as Tech-Prep participants grew from about 173,000 in school year 1992-1993 to almost 740,000 in school year 1994-1995, the last year for which the evaluation surveys collected participation data.

Three factors have contributed to the increase in levels of reported participation. First, more consortia were funded each year, and some of these newer grantees were able to document how many students were involved. Second, reporting capacity increased each year; higher percentages of consortia and of their member districts provided counts of students. Finally, actual enrollments grew as consortia expanded their efforts.

Although the overall scale of the Tech-Prep initiatives has grown dramatically, Tech-Prep is still far from reaching the middle majority of high school students and farther yet from affecting all high school students, a goal some Tech-Prep proponents advocate. In 1995, Tech-Prep students accounted for about six to eight percent of secondary students in consortium districts. The higher end of this range is an upper-bound estimate, based on the generous assumption that consortia that did not report on participation had students involved at comparable rates but were unable to collect participation data. On the basis of field experience, it is more likely that at least some such consortia

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[2]Sometimes the reverse is true: participation is reported without any clear indication of how participation is defined. This problem may occur when member schools provide consortium coordinators with participant counts but no other information. About six percent of all consortia in 1995 reported participation counts but could not explain how participation was defined.

and schools had not reached a point where students could be meaningfully said to be Tech-Prep participants. The lower-bound estimate is based on the assumption that *none* of the consortia or schools that did not report on participation had identified Tech-Prep students. The comparable ranges were two to five percent in 1993 and five to seven percent in 1994.

Compared to the scale of vocational education, Tech-Prep is thus still relatively small. About 30 percent of all high school students are considered vocational students, in that they earn at least three credits in one vocational program area (National Assessment of Vocational Education 1994). Tech-Prep initiatives appear to be reaching about a quarter as many students.

Students identified as Tech-Prep participants are unevenly distributed among the three main forms of Tech-Prep described in Chapter IV. We made a first approximation of this distribution by classifying consortia into these three models on the basis of their reported definition of participation (Table V.1). However, these participation definitions alone do not capture some important distinctions among the three models (such as student selection and clustering), so we used field experiences as a basis for adjusting these results. This combination of survey data and adjustments led us to the following broad judgments about the kind of Tech-Prep experiences students are engaged in:

- ***Relatively few students participate in the selective, comprehensive programs of study.*** We estimate that only about five percent of students described as Tech-Prep participants--less than one percent of high school students overall--are involved in selective, structured programs of study comparable to Model A.[3] A greater fraction of participants were identified by consortia that define Tech-Prep as involving students in a comprehensive set of activities: choosing Tech-Prep, developing a plan for their high school and postsecondary studies, and taking both vocational and applied academic

[3]This distribution of students across program models differs somewhat from the distribution of consortia estimated in Chapter IV. We estimate that roughly 10 percent of consortia have implemented the structured program of study approach (Model A), but the percentage of participants experiencing this form of Tech-Prep is lower because these programs are typically small.

courses. Based on field experience, however, we believe that relatively few of these Tech-Prep initiatives are selective or involve clustering students in their academic classes on the basis of their occupational program.[4]

- ***Most Tech-Prep students experience enhanced vocational programs.*** Roughly 60 percent of Tech-Prep students are in consortia that define the Tech-Prep experience as taking part in a vocational program and some subset--but not all--of several other possible elements: taking an applied academic class, choosing Tech-Prep, and completing a plan for courses to be taken in high school. These definitions can be regarded as roughly equivalent to Model B (rather than Model A), because all variants omit at least one of the elements that seem essential in the highly structured program of study.

- ***Participation in narrowly defined or undefined initiatives is common.*** A total of about 35 percent of Tech-Prep students probably participate in even less comprehensive and more diffuse initiatives. In some consortia, only a single key Tech-Prep element has been adopted. For example, some consortia defined Tech-Prep as meaning that students prepare a plan indicating the courses they will take in high school, *or* take an applied academics course, *or* take an articulated vocational course. In other consortia, participating students were reported, but the meaning of participation was not. In some cases, those students are probably participating in initiatives that are roughly equivalent to Model C, which do not target vocational students but apply instead to the general student population.

B. CHARACTERISTICS OF TECH-PREP STUDENTS

As with any education program that involves only some students, it is important to know how Tech-Prep students resemble or differ from the overall student population. A profile of participants can help assess whether there has been conscious or unconscious targeting of the program. Depending on the data that are available, it could also help us determine whether particular concerns about access to the program are being addressed (for example, whether particular population groups are participating). In this evaluation, the available data led us to three findings:

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[4]Simply counting the students at consortium schools that define participation this way would suggest they account for 30 percent of all identified participants. However, our experience suggests that as many as two-thirds are more likely participating in initiatives that resemble Model B, and a small fraction are actually in initiatives that may be closer to what we describe as Model C.

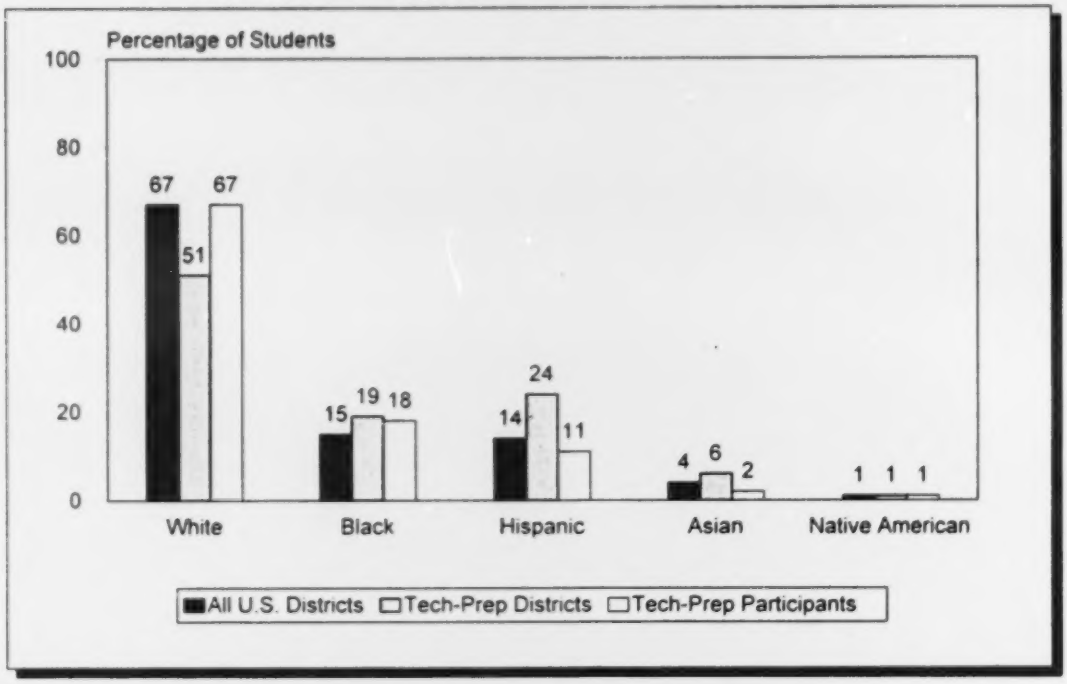
- Tech-Prep students are roughly representative of the general population of American students
- They are drawn from more than just the middle ranges of academic performance
- The need for them to take more math and science is being addressed.

1. Tech-Prep Students Reflect the Demographics of the Nation

Tech-Prep students are generally representative of high school students across the country in racial/ethnic identity (Figure V.2). As with the overall student population in the United States, about

FIGURE V.2

PERCENTAGE OF SECONDARY STUDENTS IN ALL U.S. DISTRICTS, TECH-PREP DISTRICTS, AND TECH-PREP PROGRAMS, BY RACE/ETHNICITY



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

67 percent of Tech-Prep participants in 1995, in consortia throughout the nation, were white, 15 to 18 percent were black, 11 to 14 percent were Hispanic, 2 to 4 percent were Asian/Pacific Islander,

and 1 percent were Native American. The distribution in Tech-Prep students' demographic characteristics has remained stable since 1993.

Tech-Prep students are similar to students overall in other characteristics. Consortium coordinators estimated that just under half of all Tech-Prep participants in school year 1994-1995 were female, and about one-third were economically or educationally disadvantaged. Among Tech-Prep students, approximately four percent had limited English proficiency (LEP), and seven percent had a disability of some kind. These proportions reported for Tech-Prep students are roughly consistent with those of the overall student population in the U.S. (National Assessment of Vocational Education 1994).

However, the racial/ethnic composition of Tech-Prep students deviates from that of the overall student population in the specific school districts that belong to Tech-Prep consortia. Tech-Prep participants are more likely to be white and less likely to be Hispanic than the overall student population in Tech-Prep districts (Figure V.2). Although Hispanics made up 24 percent of students in Tech-Prep districts in 1995, they accounted for only 11 percent of Tech-Prep participants. A major factor in this disparity probably is the dramatically higher dropout rate among Hispanic students and the fact that, among those who leave school prematurely, dropping out occurs on average significantly earlier in high school among Hispanic students than among black or white students.[5] Another contributing factor may be that limited English proficiency among recent

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[5]In 1992, the status dropout rate among 16- to 24-year-olds was reported as 27.5 percent for Hispanic youth, 7.9 percent for white non-Hispanic youth, and 13.6 percent for black non-Hispanic youth. Of those classified as dropouts, 42 percent of Hispanics had dropped out before 10th grade, compared to 27 percent for white youth and 23 percent for black youth (National Center for Education Statistics 1993). (These latter proportions reflect adjustments to drop from consideration youth described as having less than a sixth-grade education, a group that probably consists largely of immigrant youth who have not attended school at all in the United States.)

immigrants is a barrier to participating in technology education, an emphasis of many Tech-Prep programs.

2. Tech-Prep Participants Are Drawn from the Full Spectrum of Academic Achievement

Tech-Prep initiatives seem to reach a broader set of students than the middle majority, a group that was the focus of early Tech-Prep proponents. Most students identified as "in Tech-Prep" probably do fall into the middle of academic rankings. Given the variety of Tech-Prep implementation approaches, however, at least some consortia and schools have defined their programs and what it means to be a participant in a way that includes a wider range of students.

Data from the 10 in-depth study sites illustrate the diversity in the academic performance of students considered Tech-Prep participants.[6] Across these 10 sites, about 60 percent of Tech-Prep students are ranked by their schools as falling into the middle two quartiles of their graduating classes. The remaining Tech-Prep students are split about equally between the top and bottom quarters of their graduating class. Thus, at least in these sites, Tech-Prep includes students with lower and higher levels of academic performance than the term "middle majority" might suggest.

However, some indications from the in-depth study sites support the general observation that Tech-Prep tends to be geared to students whose educational achievements have lagged somewhat behind those of students with the highest educational aspirations. In the in-depth study sites, for example, the 60 percent of Tech-Prep students in the middle quartiles of their graduating class were more often found in the lower of the two quartiles. Tech-Prep students in these sites are also far less likely to be prepared to enter four-year colleges and universities than are American students as a whole. Although most Tech-Prep students in the in-depth study site samples completed high school,

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[6]These 10 sites cannot be considered statistically representative of Tech-Prep students in general, but the findings highlighted here are consistent with our observations in other schools.

far fewer were prepared to enter competitive four-year colleges or universities.[7] About 16 percent of them completed the courses typically required for entrance into four-year postsecondary institutions, compared to 46 percent of U.S. high school students overall (National Assessment of Vocational Education 1994).[8] The most common reason for this difference is that Tech-Prep students have not taken the foreign language courses required by many four-year colleges, often choosing vocational courses as electives instead.

3. Perceived Need for More Math and Science Is Being Addressed

To succeed in postsecondary education, and particularly in programs focusing on technical careers, Tech-Prep students must have a solid grounding in mathematics and science. High school teachers and postsecondary staff at in-depth study sites frequently noted that students may complete their vocational classes successfully but still lack the math and science skills to take on college-level curriculum. Most community colleges report that large percentages of their entering students need remedial work in academic subjects.

Field observation and survey data make it clear that a major emphasis in some Tech-Prep consortia is to increase achievement in mathematics and science. Consortia and member schools pursue this goal in various ways. Some require that Tech-Prep participants complete more semesters of math and science than would otherwise be required to graduate from high school. Others have

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[7]The percentage of students identified in 11th grade as Tech-Prep students at these sites who graduated from high school cannot be estimated precisely because of high student mobility in several sites and nonresponse to the student follow-up survey. The overall reported graduation rate was at least 77 percent (based on the assumption that all students whose transcripts did not indicate graduation had dropped out) and at most 98 percent (assuming they had all transferred and graduated).

[8]The National Assessment of Vocational Education (NAVE) defined the college-prep curriculum as including eight semesters of English, four of a foreign language, six of science, and six of mathematics, with at least one course in algebra or higher mathematics.

guided Tech-Prep students into particular math and science classes where instruction is more applied and hands-on. Among the 10 in-depth study sites, about half encouraged or required Tech-Prep students to take applied science courses, such as Principles of Technology and other applied physics, biology, or chemistry classes.

Discussions with teachers and counselors in the in-depth study site visits suggest that these requirements and options have at least some of the intended effects. In the Hartford area consortium, for example, a high school Tech-Prep liaison who has worked with Tech-Prep from its inception asserted that the availability of the applied science classes has led many students to take a physics course who otherwise would have avoided it. Staff in other sites reported similar results.

Transcript data from the 10 in-depth study sites lend some credence to such judgments, although rigorous evidence of impacts on course-taking patterns is lacking. For example, although Tech-Prep participants in these sites were much less likely than the national average to complete an entire college-prep program, almost 40 percent of them completed the number of mathematics, science, and English classes required for four-year college entry. About 87 percent of the Tech-Prep students earned credits in algebra or a more advanced math class, compared to the overall national average of 82 percent reported by the NAVE. On average, the Tech-Prep participants in the classes of 1995 at these sites completed 3.0 credits in math and 3.2 credits in science, more in both subjects than the 1990 national average among vocational students (2.8 in math and 2.3 in science).[9]

The introduction of applied curricula and other factors may be increasing students' exposure to math and science curricula, but it remains unclear whether achievement levels are correspondingly increasing. As noted in Chapter III, applied academic classes have not been complete successes.

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[9]Between 1990 and 1995, some states increased graduation requirements in these subjects. Other factors besides Tech-Prep implementation thus contribute to observed levels of math and science course taking.

Some started out with prospects of presenting new challenges to students but proved too ambitious and had to be extended over longer periods than they were originally designed for or replaced. Even data that suggest high rates of completion of math and science credits may, to some extent, reflect a spreading out of math curriculum over longer periods rather than success in getting students to master more advanced material. With or without substantiated cause, some applied academic classes have been denied recognition by four-year colleges as equivalents of traditionally taught, more abstract classes. This evaluation was not designed to provide a solid foundation for conclusive judgments about Tech-Prep impacts on academic achievement. Therefore, other research will be needed before we can confidently conclude that Tech-Prep has any consistent effect on skill levels.

VI. POSTSECONDARY PROGRESS OF TECH-PREP STUDENTS

Tech-Prep is intended to help students prepare for life after high school and, particularly, for further education and training. The Perkins Act saw Tech-Prep as "leading to a 2-year associate degree or a 2-year certificate." It promoted links between secondary and postsecondary institutions and emphasized articulation as a way to facilitate students' transitions to community and technical colleges and possibly later to four-year institutions. As a result, policymakers and local program leaders have often perceived Tech-Prep as a strategy that can improve the likelihood that participants will enter and complete postsecondary education.

Expectations that Tech-Prep as currently implemented might dramatically affect continuation to postsecondary education are unrealistic, however. The prevalence of implementation models that make only minor changes in students' experiences suggests that Tech-Prep's overall influence on postsecondary paths is likely to be limited (although rigorous measures of impacts cannot be drawn from this evaluation). In this chapter, we examine how consortia seek to promote postsecondary transitions (Section A), and then present several views of the actual postsecondary paths Tech-Prep participants follow (Section B). We reached the following main findings:

KEY FINDINGS ABOUT POSTSECONDARY PROGRESS

Tech-Prep implementation often strengthens general messages to students about the value of postsecondary education. In most places, however, Tech-Prep adds little additional career focus to students' school program and includes students with diverse goals. Thus, Tech-Prep probably will have little effect on the continuity of career interests or choices of postsecondary programs.

More than half of Tech-Prep graduates go directly to postsecondary education or training. About 15 to 19 percent choose articulated occupational programs at community colleges.

After high school, Tech-Prep participants often combine work and further studies, but their jobs are often unrelated to career goals or postsecondary programs. In the in-depth study sites, 72 percent of Tech-Prep students were working 18 months after leaving high school, but only 25 percent of the jobs they had held were ones they felt were related to their career goals.

A. TECH-PREP FEATURES THAT COULD AFFECT POSTSECONDARY PATHS

Although a central feature of Tech-Prep is articulation between high school and associate degree programs at local community colleges, Tech-Prep students have other postsecondary options. They may choose to attend four-year colleges or universities, enter apprenticeship programs, begin course work at a community college outside the consortium, combine education at such institutions with part-time work, or forgo further education in favor of full-time employment.

The experience of participating in Tech-Prep in high school could affect students' postsecondary endeavors in several ways. Tech-Prep could simply increase the rate at which students go on to any form of higher education or training by affecting their interest in doing so or their success in winning acceptance to postsecondary programs. It could promote a more direct route to postsecondary education or training, encouraging students to pursue further education more quickly after high school. The Tech-Prep experience also could affect the types of programs or institutions students choose to enroll in or the career areas they favor.

The national Tech-Prep evaluation provides a basis primarily for a qualitative assessment of how Tech-Prep, as actually implemented, might be having such effects. No basis for measuring the impact of Tech-Prep on postsecondary enrollment exists, because the evaluation design did not include identifying and comparing outcomes for representative groups of students who differ only with regard to whether they participate in Tech-Prep. However, annual consortium surveys, extensive interaction with school and consortium personnel and students in the 10 in-depth study sites, and the follow-up survey in selected schools in those sites, provide a foundation for three findings about the efforts consortia are making and the likelihood of impacts:

- In some communities, Tech-Prep has contributed to an increased emphasis on general educational planning in high school and on college outreach, in an effort to increase chances that students will go on to some kind of postsecondary education.

- The most prevalent models for Tech-Prep in high school limit chances that it will affect the continuity of students' career pursuits.
- Few Tech-Prep programs include secondary-postsecondary linkages that are likely to affect students' particular choices of postsecondary programs.

1. Tech-Prep Has Helped Increase Emphasis on Educational Planning and College Outreach

As attention to career guidance has increased in recent years, interest in helping high school students think carefully about their postsecondary options also has increased. Many communities now are giving greater attention to a wider range of preparatory activities affecting all students. These activities are designed to help students identify a career interest, learn about its specific educational requirements and particular institutions that offer relevant programs, and develop a strategy for pursuing their goal. Many guidance programs now require all students to gather information about a career of interest and write a paper or give an oral presentation in class about the career and the education necessary to enter it. High schools increasingly have encouraged the development of individual educational plans that lay out secondary courses and postsecondary options relevant to students' career objectives. Student educational plans were in use in all high schools in 33 percent of Tech-Prep consortia in 1993 and in 41 percent by 1995.

Activities to promote postsecondary planning and interest in higher education are thus frequently available to all students, and those considered Tech-Prep participants may particularly benefit. In addition, some steps to promote postsecondary planning and further education are specifically designed for Tech-Prep participants:

- ***Postsecondary Emphasis in Program Information.*** Tech-Prep consortia often focus on postsecondary options in program orientations and promotional brochures. These materials usually describe community college programs available to students who complete the secondary Tech-Prep component and how articulation agreements make it possible to enter them with a head start. Some consortia include postsecondary

counselors or faculty in orientations for students and their parents, to underscore that Tech-Prep means going on to college.

- ***Special Access to College Programs.*** Some consortia arrange to give Tech-Prep students special priority to enter college programs. For example, Tech-Prep students in Dayton, Ohio are encouraged to take the college placement test as juniors; if they pass they are considered admitted to the relevant postsecondary program at Sinclair Community College and are placed immediately on the waiting list if one exists. In the Fresno, California consortium, State Center Community College allows its occupational program instructors to visit high school vocational classrooms in the spring, describe relevant program offerings at the college, and preregister seniors who think they will enter the college program the following fall.

- ***Targeted Scholarships.*** A few consortia develop or promote special college scholarships for Tech-Prep students to strengthen incentives for postsecondary education. The Dayton consortium offers eligible Tech-Prep students up to $3,000 for the postsecondary part of the program. Florida offers the Gold Seal Scholarship to high school students who complete a vocational sequence and maintain a 3.5 GPA in those courses and a 3.0 GPA overall. The Gainesville consortium publicizes this scholarship to Tech-Prep students, many of whom are eligible or could be eligible.

In a variety of other ways, secondary and postsecondary members of consortia cooperate to arrange outreach efforts by college staff. These arrangements can in part be viewed as new recruiting opportunities for community colleges, but often they take a form specifically designed to overcome high school students' anxieties about pursuing a college education or other barriers that might stop them. In some communities, this is particularly important because a substantial percentage of Tech-Prep students come from families in which no one has ever attended college, and basic gaps in information and misperceptions may need to be corrected. For example, college staff in Springfield, Massachusetts, have arranged to give placement tests to Tech-Prep students in their junior year in high school, to familiarize them with what they would encounter at the college and to help high school teachers focus senior year instruction on addressing revealed deficiencies. It is common for community college staff to make presentations at local high schools to familiarize

students with college programs; sometimes, Tech-Prep high school students are taken on tours of the college campus.

Usually, emphasis is placed more strongly on promoting transitions to college than to employment. To be sure, vocational instructors, even in the absence of Tech-Prep, often have local contacts with employers that can lead to jobs for their students, and some schools post job listings or have job banks and staff members who maintain them.[1] However, the general message coming from staff responsible for Tech-Prep emphasizes that it is a path to further education.

2. The Prevalent Tech-Prep Models Are Unlikely to Increase Continuity in Career Focus

As envisioned by early proponents and reflected in federal legislation, Tech-Prep was expected to serve students interested in technical careers who would enroll in career-focused programs of study in high school and continue in them in college to receive an associate's degree. Such an expectation would be reasonable if the assumptions are made that (1) Tech-Prep is as a career-oriented program of study that students would choose carefully, making some conscious (even if tentative) commitment to a broad career direction; and (2) the academic and occupational course work in the high school part of the program would improve students' preparation for and interest in the postsecondary part of the program.

The prevalence of Tech-Prep implementation models that do not create career-focused programs of study calls these assumptions into question. Tech-Prep most often takes more loosely defined forms (called Models B and C in Chapter IV). As a result, the students it attracts are more varied, and the programs less focused, than the two assumptions would imply. There are two reasons these

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[1]About two-thirds of consortia said that, in some of their schools, teachers helped students find jobs. Special staff members devoted to job placement were less common; about 57 percent of consortia in 1995 said that any of their schools had such staff, and 43 percent said none of their schools did.

assumptions now appear unwarranted: (1) relatively weak student commitment to a career focus, and (2) relatively minor changes in academic programs associated with most forms of Tech-Prep.

a. Weak Commitment to Career Direction

Particularly in the absence of strong career development in the early years of schooling, many teenagers can be expected to change their minds about their future careers, sometimes more than once. The more structured forms of Tech-Prep (Model A) require a conscious commitment to a career, because that choice affects students' high school program substantially; these forms are most likely to attract students whose career interests have crystallized at least tentatively. More common, however, are the other less structured models that require no more commitment to a career direction than traditional vocational courses. Many students choose these courses because they relate to their hobbies or leisure interests or because their friends are taking them (as is probably true for students in general). As a result, Tech-Prep students may have little interest in pursuing a career-oriented high school program to the college level. Tech-Prep students from the in-depth study sites who responded to the follow-up survey illustrate this volatility; almost half said they no longer had the same kind of career in mind that they did when they were finishing high school 18 months earlier.

b. Academic Changes Sometimes Marginal

In implementing Tech-Prep, schools have often sought to improve participants' academic skills in one of two ways: (1) by making academic classes they take more applied and more engaging for students; and (2) by getting them to take more academic classes, particularly math and science. These two approaches interact; there are indications that, by making some classes more applied, Tech-Prep leaders get students to take classes (such as physics) that they otherwise would not be exposed to.

Despite considerable progress in introducing applied academic approaches, however, the difference that these curriculum changes create in individual students' experiences often is marginal. In the most common implementation models and definitions of participation, participants' high school experience may be changed in that they take a math or science course designated as "applied"--sometimes for just one year. Some courses are so designated simply because their teachers have attended a brief professional development workshop on applied instructional methods. Field observation suggests that instruction may not, at least without further teacher training and substantial experience, differ dramatically from the teachers' previous practice. Sometimes, the significance for students is constrained by the newness of the classes; schools and teachers are learning more applied methods as they try them, and actual practice often falls short of theory. As noted in Chapter III, some schools have changed strategies and are still experimenting with new approaches. Making academic instruction more applied thus seems to remain a central goal in many Tech-Prep consortia and their schools, but expectations that Tech-Prep would already have had strong effects on students' academic preparation for college are probably unrealistic.

3. Postsecondary Linkages Rarely Stressed Enough to Affect Students' Choices

Great effort is required to develop seamless programs of study that include both high school and postsecondary stages. Of necessity, this effort usually focuses on linking specific institutions--particular high schools to particular colleges (usually community colleges) whose faculty work together. This effort pays off most when students choose to enroll in the particular postsecondary institutions that have helped to develop the program.

Given the relatively broad net that Tech-Prep implementation models cast, however, participants not only have uncertain career interests but wide-ranging ideas about where they will go for their further education. Many want a four-year baccalaureate degree, and they have no clear plan to

pursue a specific associate degree program, even as a first step toward a four-year degree. Even where Tech-Prep has been implemented as a selective program (Model A), students typically have passed a screening process and may have the motivation and record to go directly to a four-year institution.

Only rarely is Tech-Prep implemented in a way that stresses continuation to particular college programs. Few consortia have defined programs of study that explicitly link a student's selection of high school studies to specific subsequent courses at the college level. Although articulation agreements are in place almost universally, they rarely are promoted systematically to students. Most consortia concentrate their resources on improving secondary academic curricula or career guidance rather than on creating seamless secondary-postsecondary programs of study.

To use the Tech-Prep concept to promote transition to a postsecondary stage of the program requires emphasizing features typically found in consortia that stress structured programs of study (Model A) as their implementation approach. Important ingredients include careful selection of students to ensure some level of interest in the target occupation, close ongoing attention paid to these students by high school and college faculty in the occupational area, and carefully planned activities sponsored by career faculty that engage students in college-based activities while they are still in high school.

No suggestion is being made here that educators should try to constrain students' choices or push them into the community college extension of their Tech-Prep high school experience. Students may succeed in diverse educational programs after high school. Students' interests may change, previously unknown talents and ambitions may emerge, and personal circumstances may evolve which warrant considering a variety of postsecondary paths. Given the diverse ways in which Tech-Prep has been implemented, these factors are likely to lead students in many directions.

As a result, the idea that Tech-Prep would be a program that students would begin in high school and follow to a community college degree is rarely realized. Of the three models we have observed, the structured, comprehensive program of study (Model A) is most likely to fulfill this expectation.

B. EDUCATION AND EMPLOYMENT AFTER HIGH SCHOOL

Students may take varied paths to the kind of career-oriented employment that is the ultimate objective of Tech-Prep. Some may enter the workforce only after completing an associate degree, baccalaureate degree, or training certificate. Some students work and pursue higher education concurrently. Others may seek full-time employment after high school and pursue no further education. The focus of Tech-Prep as defined by early proponents and the federal legislation was on linking high school and two-year colleges and promoting pursuit of two-year degrees, although the diversity of implementation models (as discussed earlier) suggests that we should expect considerable variation in actual postsecondary experiences.

The evaluation provides a basis for describing postsecondary pursuits of Tech-Prep participants, but it cannot yield measures of program *impact*--the extent to which the program leads to better or different outcomes than students would have achieved without Tech-Prep.[2] We draw on two sources to describe participants' postsecondary activities: (1) the national surveys of local consortia, and (2) the small follow-up survey in 10 sites of students who were identified as Tech-Prep participants as juniors in fall 1993 (the graduating class of 1995). Each source has limitations even for description of outcomes. In the consortium survey, estimates must be based on the subset of

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[2]Estimating program impact requires (1) a clear and fairly consistent definition of the program intervention being tested, and (2) a clear distinction between students exposed to the program and those who are not (a comparison or control group). Neither condition is well satisfied in the case of Tech-Prep as it has been implemented across the country, except in schools that have focused their implementation on Model A.

consortia that could provide information about the postsecondary educational pursuits of their Tech-Prep high school graduates (205 of the 897 respondents). In the student survey, estimates are based on responses from 486 individuals (60 percent of the original sample), and the survey is not representative of all Tech-Prep consortia. Nevertheless, these sources give approximately consistent results and can provide a useful indicator of postsecondary outcomes for Tech-Prep students.

Three main findings emerged from analysis of these two sources:

- A majority of Tech-Prep students enroll in some form of postsecondary education and training.
- Relatively few students follow the originally anticipated Tech-Prep path to an articulated occupational specialty at a community-technical college.
- Many Tech-Prep students combine postsecondary education and employment, but the employment they find in the short term is usually unrelated to career goals.

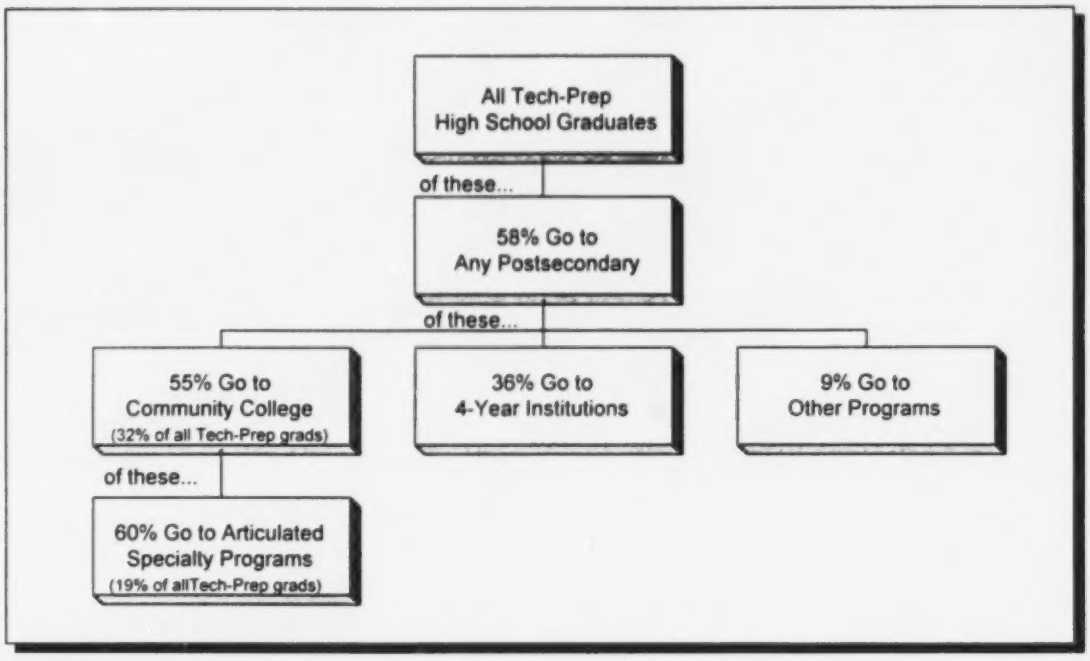
1. Pursuit of Postsecondary Education and Training Is Common Among Tech-Prep Students

Schools in general promote the virtues of postsecondary education, and guidance counselors provide routine assistance for students who plan to enter college. Some Tech-Prep consortia have made a special effort to encourage Tech-Prep students to pursue advanced education and training, although this encouragement only rarely focuses on guiding students directly into the postsecondary continuation of a high school Tech-Prep program.

Tech-Prep students do, in fact, enter higher education and training at substantial rates (Figure VI.1). The annual consortium surveys suggest that the share of identified Tech-Prep high school graduates who can be tracked by local coordinators and reported as entering postsecondary programs has increased since the early years of Tech-Prep implementation--from just under 50 percent in 1993

FIGURE VI.1

TECH-PREP STUDENTS' TRANSITIONS TO POSTSECONDARY EDUCATION AND TRAINING



SOURCE: Inventory of Local Tech-Prep Planning and Implementation, fall 1995.

to 58 percent in 1995.[3] These students are attending programs at community and technical colleges, four-year colleges and universities, proprietary postsecondary schools, registered apprenticeships, and the armed forces. The Tech-Prep student follow-up survey in the 10 in-depth study sites 18 months after participants' expected high school graduation date found similar results; about 61 percent of respondents had enrolled in a postsecondary education or training program.[4] These rates

[3]This trend may be due, at least in part, to improvement in the ability of consortium coordinators to gather information on the postsecondary activities of Tech-Prep participants after they graduate from high school.

[4]However, this estimate (which includes two- and four-year colleges, apprenticeships, nursing schools, and business/secretarial schools) is probably an upper bound, because the 40 percent of the sample who did not complete the survey may have had lower rates of postsecondary education and training. For example, if only 25 percent of the nonrespondents had enrolled in a program, the real overall rate would be 46 percent.

of entry to postsecondary education are roughly comparable to those estimated for the general population of high school students nationwide; the National Center for Education Statistics (NCES) reports that, in 1995, about 62 percent of all U.S. high school graduates entered a postsecondary institution by October after their graduation (National Center for Education Statistics 1997). The similarity of postsecondary matriculation rates for the small sample of Tech-Prep participants and students nationwide is consistent with our assessment that Tech-Prep participants as they are identified by schools come from a fairly broad and typical spectrum of performance and aspirations.

2. The Anticipated Path to Articulated College Programs Is the One Less Traveled

Tech-Prep proponents and Title IIIE of the Perkins Act originally anticipated that the program would encourage students to pursue a career preparation path from high school to a two-year college and an associate's degree or certificate. These credentials were expected to be the culmination of a cohesive, career-focused secondary-postsecondary program of study that provides a strong foundation of occupational and academic skills. Actual Tech-Prep implementation most often diverges from this model, however, so we might expect some paths students travel after high school to lead them in other directions.

In fact, Tech-Prep participants who pursue postsecondary education or training do follow other paths almost as often as they go to community colleges. As consortium coordinators in the national surveys reported, a slight majority (55 percent) of the students whose postsecondary direction they could determine enrolled at a community college. The remaining 45 percent entered four-year institutions or other options such as the military, proprietary training schools, or apprenticeships.[5]

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[5]Some proprietary schools and apprenticeships, of course, may be logical continuations of high school Tech-Prep programs; they accounted for about three percent of the students reported as entering postsecondary programs.

Moreover, it appears that Tech-Prep students are increasingly likely to choose four-year colleges and universities over other postsecondary options; the proportion of Tech-Prep postsecondary enrollees reported as entering a baccalaureate program rose during the three years of the evaluation consortium surveys, from about 20 percent in 1993 to 36 percent in 1995.

Articulation was expected to smooth the way to the community college for Tech-Prep participants, but its role in doing so may be declining in importance. In 1993, about 80 percent of the Tech-Prep students reported by consortia as entering community college were enrolled in articulated occupational specialty programs. By 1995, this rate had dropped to 60 percent (Figure VI.1). Thus, it appears that Tech-Prep high school graduates entering community colleges were increasingly likely to be entering general academic transfer programs or occupational programs that were not linked to secondary Tech-Prep sequences.[6] Overall, then, we estimate from the national consortium survey that about 19 percent of Tech-Prep high school graduates are entering articulated occupational associate degree or certificate programs.[7] This estimate is consistent with results from the 10-site student follow-up survey, which found that approximately 15 percent of respondents had enrolled in postsecondary programs for which they had earned articulated credits that were being counted toward their degree.

Tech-Prep students may follow postsecondary paths other than the one that leads to articulated community college programs for a variety of reasons (some of which we discussed earlier). Tech-Prep consortia identify a broad range of students as participants. At high school graduation, many

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[6]This decline occurred at the same time that the reported rate of Tech-Prep students' entry into four-year baccalaureate programs rose dramatically.

[7]About 58 percent of Tech-Prep high school graduates were reported as going to any postsecondary school. Of these, 55 percent went to community colleges, and 60 percent of that group entered articulated specialty programs (Figure VI.1).

Tech-Prep students have not yet clearly chosen a career objective that would motivate them to enter a specific two-year occupational program. Others aspire to baccalaureate degrees or careers for which such a degree is appropriate, and they have the academic ability and motivation to pursue such goals. Tech-Prep programs themselves seem to have become less focused on creating structured pathways that lead to particular associate degree programs. In part, this shift reflects efforts at the consortium and school level to overcome the "tracking" concerns about Tech-Prep expressed by parents, students, and counselors and the fear that articulated Tech-Prep sequences will lock students into narrow education and career options.

Tech-Prep students also sometimes face barriers to immediate entry into articulated occupational programs that can deter them from this path. Waiting lists for associate degree programs (particularly in business and health) can lead students to enter general programs initially (with the hope of completing academic requirements for occupational programs) or to defer or abandon their plan to attend the community college. Many students, including some in Tech-Prep, fail to meet the academic proficiency levels required for entry to some college programs; these students may take only developmental or remedial courses for a semester or longer.[8]

3. Many Work and Study, But Jobs Usually Are Not Linked to Tech-Prep Career Goal

Tech-Prep coordinators usually recognize that good employment immediately after high school is a goal for which they must prepare many students. Even if they stress the importance of postsecondary education, a substantial percentage of students will prefer or need to work after graduation. Whether they work part-time or full-time, putting into practice skills they learned in a

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[8]The student survey in the in-depth study sites indicated that more than a third (37 percent) of those who were attending community colleges had not--18 months after high school graduation--started a program leading to a degree.

well-developed Tech-Prep program could potentially mean better wages and further progress in developing those skills.

Many Tech-Prep students do indeed work after high school, often in combination with postsecondary education. Among the 486 Tech-Prep students at the in-depth study sites responding to the follow-up survey, nearly three-quarters (72 percent) were working 18 months after graduation, and about half of that group were going to school at the same time. Over the 18-month period since high school, they held an average of 2.5 jobs, earning an average of slightly over $6 per hour. Nearly a quarter (23 percent) of their jobs included health insurance benefits, and nearly half of the students received pay increases at least once.

Some of this post-high school employment is related to the career focus of students' high school or college programs. At the 10 in-depth study sites, about 25 percent of the jobs held by the follow-up survey respondents were ones they described as related to their career goals. About 26 percent of the jobs, according to respondents, drew on skills that high school courses had helped them develop.[9] Fewer than three percent of the students reported that their employment was connected to their postsecondary education programs.

These findings concerning employment reinforce the impression that Tech-Prep programs exert at most a modest influence on the postsecondary paths of the students who are considered participants. When they go on to postsecondary education, they are likely to pursue the same variety of program paths as other students. In the employment students follow right after high school, connections to the focus of their high school Tech-Prep program are more the exception than the

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[9]Relatively few consortia in the national consortium surveys (107 of 896 in 1995) were able to report on Tech-Prep graduates entering employment related to their program of study. Data from those that could, however, suggest that about one-quarter of Tech-Prep high school graduates may be employed in positions related to their high school occupational programs. This estimate is consistent with the 10-site findings.

rule. In large part, this generalization results from the underlying findings about the diversity of Tech-Prep programs and the students who are counted as participants.

Although postsecondary activities of Tech-Prep students are diverse and usually diverge from the path most emphasized in the Tech-Prep legislation and the models promoted by early Tech-Prep proponents, there is no basis for concluding that students do better or worse than they would have if Tech-Prep initiatives had not been undertaken. Clearly, there are more paths to a successful career than the one that leads directly from high school to an articulated career program at a community college. Some students' ambitions and interests may be shaped or stimulated by a Tech-Prep experience that enhances their success in the workplace or their accomplishments in other educational programs. We simply know that the educational path that Tech-Prep programs were expected to emphasize is not the one most often followed.

VII. ACHIEVEMENTS AND FUTURE OF TECH-PREP

The Tech-Prep Education Program was conceived in Title IIIE of the 1990 Perkins Act as a distinctive approach to career preparation for youth, different from other education strategies. Both traditional vocational education and Tech-Prep focus on preparing students for target occupations or careers. The distinctive feature of Tech-Prep, however, is its emphasis on a program of study aimed at giving students a more comprehensive and rigorous preparation for a career path. The program of study would integrate academic and occupational course work and instructional methods, and provide a framework for giving new importance and broader scope to links between high schools and postsecondary institutions, beyond that achieved by earlier efforts at articulation. The emphasis on making academic instruction more applied and rigorous was an effort to improve on the general education track that students might have followed in the absence of Tech-Prep.

Seven years later, our assessment is that the Tech-Prep initiative has made important contributions in American education but could be improved by a clearer focus on the full set of legislative objectives and the underlying ideas of early Tech-Prep proponents. Federal resources have helped many communities implement particular elements of Tech-Prep. Relatively few communities, however, have implemented Tech-Prep elements fully--as a set of structured and comprehensive programs of study. In the absence of more specific guidance in the language of the federal legislation, most consortia have made incremental changes that are consistent with widely favored ideas for improving vocational education and education in general but that, by themselves, fall short of creating a new and markedly more coherent course of study for students. Tech-Prep's chances of making an important difference in students' motivation, school performance, and postsecondary paths to success are unlikely to improve substantially unless it more consistently

emphasizes bringing together the elements of Tech-Prep for participating students. If a distinct Tech-Prep program at the federal level is going to continue, with a dedicated stream of funding to states and local consortia, efforts should be redoubled to use federal resources to develop Tech-Prep in this way.

The conclusions presented here are drawn from detailed examination of the *implementation* of Tech-Prep, not of its impacts on students. Whether Tech-Prep, in any of its forms, improves student outcomes is a question that still remains to be addressed; this study was not designed to answer that question. However, our five-year evaluation suggests that prospects for Tech-Prep to change the educational path and success of students in the ways framers of the Tech-Prep legislation anticipated will be enhanced if federal and state education agencies renew their emphasis on developing structured, focused programs of study with a strong career theme, meaningful integration between technical and academic curricula, and a close link between the high school and postsecondary stages of the program.

In this final chapter of the evaluation report, we examine how the promise of Tech-Prep can be more fully realized. In Section A, we review Tech-Prep's major accomplishments and the remaining implementation challenges. Next, in Section B, we discuss key issues that are likely to affect the future development of Tech-Prep. Finally, in Section C, we suggest ways to enhance the Tech-Prep concept and its effectiveness.

A. ACCOMPLISHMENTS AND CHALLENGES

Initiatives broadly labeled as Tech-Prep have now been widely introduced throughout most of the United States, with considerable variation in implementation approach and intensity of effort. States have awarded federally funded grants to more than 1,000 local consortia; these consortia include more than 70 percent of all U.S. school districts, which, in turn, serve about 90 percent of

all American high school students. We found consortium communities with thriving, rigorous, well-regarded Tech-Prep programs and others in which Tech-Prep concepts received only passing attention and yielded little of the changes envisioned by the federal legislation. This kind of variation in implementation can be expected in any nationwide reform initiative and particularly in education, where local decision making plays a large role in determining program direction and quality. A realistic assessment of the effectiveness of Tech-Prep implementation must acknowledge both what has been accomplished and what remains to be done.

1. Tech-Prep Accomplishments

Over the past seven years, four important benefits have emerged from Tech-Prep implementation efforts. These efforts have:

- ***Opened New Lines of Communication and Cooperation.*** Tech-Prep has helped to reduce the professional isolation of teachers, increase opportunities for professional growth, and provide channels for exchange of information on successful practices. Tech-Prep consortia have played a key role in promoting staff development and collaboration in curriculum development between academic and vocational teachers, as well as among academic teachers in different subject areas. Articulation meetings and other consortium activities often involve both secondary and postsecondary faculty, allowing them to learn about each other's courses and to work together on curricula. Teachers usually value these interactions, which potentially can affect how they teach.

- ***Mobilized Interest in Curriculum Change and Innovation.*** Tech-Prep resources have played a key role in stimulating and coordinating efforts to infuse academic classes with greater emphasis on problem solving, application of theoretical concepts, and examples and exercises drawn from real career contexts.[1] These efforts have different names at the local level--applied academics, project-based learning, interdisciplinary lessons--and much experimentation is still under way. Although little rigorous research has been conducted to assess the effectiveness of these strategies, advocates report anecdotal evidence suggesting that they can increase students' motivation and interest and lead to

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[1]Interest in these changes has been encouraged by the Tech-Prep legislation's focus on integrating academic and vocational education in both content and pedagogy. The Perkins Act in general encourages integration of academic and vocational education, but this goal has been particularly emphasized in the use of Tech-Prep resources.

higher student achievement. Consortia have heavily supported these new approaches by purchasing commercial curricula, releasing teachers from class time to develop their own new curriculum materials, and providing teacher training.

- ***Stimulated Greater Employer Contact with Schools.*** In many communities, Tech-Prep has been a catalyst for getting employers involved in school activities beyond their traditional donations of equipment or service on vocational advisory boards. Employers increasingly work with school staff; they help to develop technical curricula, promote Tech-Prep to students and parents, and provide opportunities for some Tech-Prep teachers and students to visit workplaces. Business involvement in Tech-Prep has become increasingly common, in part because leaders of Tech-Prep consortia have been influenced by the emphasis in the School-to-Work Opportunities Act of 1994 (STWOA) on employer involvement. Educators increasingly view their interactions with employers as useful ways to bring new technology and information about the world of work into their classrooms and to develop lessons involving problem solving of the sort required in the workplace.

- ***Focused Attention on the Need to Strengthen Math and Science Skills Among Vocational Students.*** Tech-Prep has increased awareness of the importance of math and science competencies for vocational students, many of whom in the past might not have gone beyond the minimum requirements in these subjects. Many schools, as part of their Tech-Prep initiative, encourage vocational students to enroll in applied math and science courses. To be sure, the benefits of these efforts have not been measured rigorously, and some applied academic courses simply replace a traditional course (for example, Applied Math I instead of Pre-Algebra). In other schools, however, staff report that the availability of applied courses and guidance from counselors leads students to take courses, particularly in science, that they would not otherwise have attempted. Many teachers and counselors thus see Tech-Prep as a way to encourage vocational students to take more math and science. In those consortia that emphasize Tech-Prep course sequences as the core of their program model, increasing math and science course taking is seen as an important way to enhance vocational programs and students' future options.

In many communities, Tech-Prep initiatives have been an important spark for educational change. In some communities, Tech-Prep leaders have been at the center of efforts that have resulted in increased collaboration, enthusiasm, and experimentation with educational strategies that may prove to be important building blocks for school-to-work and other education reforms.

2. Implementation Challenges Still Unmet

Despite these important benefits of the Tech-Prep initiative, implementation of Tech-Prep has fallen short of the vision set forth by early proponents and the aims of the legislation. We estimate that, in at least half of all local consortia, Tech-Prep implementation has consisted of fairly marginal and sometimes unconnected efforts to develop particular aspects of Tech-Prep, rather than to create a coherent program for students that substantially changes their educational experience. It has given less emphasis than expected to students' transitions from the high school phase to a college phase of the program. Finally, it still has not reached a substantial fraction of American students, even in the diverse implementation forms it has taken.

a. Achieving the Distinctive Potential of Tech-Prep

If Tech-Prep merits being distinguished from other education programs, its distinction lies in the coherent, career-focused programs of study that the early proponents of Tech-Prep supported. From our field observation, we conclude that these structured programs of study--what we have labeled Model A--have real promise for affecting student achievement and postsecondary transitions. However, the federal stance in promoting Tech-Prep, in keeping with the lack of specificity in the federal legislation, has done little to single out that model as a better approach than others to implementing Tech-Prep. At the state level, most education agencies have been supportive and loosely prescriptive in defining what Tech-Prep means, distributing funds, and assessing local efforts to implement Tech-Prep. As a result, educators at the local level have adapted and selected among the legislatively defined elements of Tech-Prep, and wide variation exists in how Tech-Prep has been interpreted across states, within states, and within local consortia. Thus, there is no simple way to describe what Tech-Prep actually is or the distinctive experiences of participants. Although it is unrealistic to expect any program model to be implemented with strict uniformity, arguments for a

special federal investment in Tech-Prep would be strengthened if greater emphasis were placed at all levels on implementing the distinctive core features of Tech-Prep as a coherent program.

Understandable constraints and pressures have contributed to the diversity in how Tech-Prep is interpreted and implemented. To make Tech-Prep more appealing to a broad student population and to avoid linking it in students' and parents' minds with vocational education, many consortia have consciously avoided implementing comprehensive programs of study that involve a choice of career focus and commitment to a sequence of courses. Many consortia have rejected the program of study model because they fear Tech-Prep will be perceived as a program that leads students away from the path to a baccalaureate degree and, therefore, as a form of tracking. Scheduling and cost limitations have stopped some schools from trying to cluster students in key classes, which can be a critical ingredient in developing meaningful integration between academic and vocational instruction and creating a career-focused program. Some consortia receive grants that are too small by themselves to provide a base for far-reaching change such as the creation of career-focused programs of study, and their member schools lack or cannot commit their own resources to this purpose.

Once this distinctive feature of Tech-Prep is sacrificed, however, it becomes unclear what Tech-Prep really is. What can make Tech-Prep distinctive and promising is an emphasis on articulated programs of study that could (1) deliver coherently related and challenging academic and technical content, (2) use curriculum integration and applied instruction to improve learning of rigorous theoretical concepts, and (3) emphasize continuation into postsecondary education or training that would build on the career preparation students began in high school. In many consortia, this comprehensive model has been watered down or ignored; Tech-Prep is simply an effort to keep vocational course articulation agreements up to date or to train academic teachers in applied learning

approaches. It is unrealistic to expect the outcomes hoped for in Tech-Prep--better technical and academic competencies, greater student focus on the future, and higher rates of postsecondary enrollment--from consortia that have adopted interpretations of Tech-Prep that involve discrete, unconnected changes that rarely make more than a marginal difference in the educational experience of the individual student.

b. Promoting Postsecondary Transition as Part of Tech-Prep

One of Tech-Prep's major and distinctive features was its intended focus on getting students who would otherwise not earn a baccalaureate degree into postsecondary education and training. The legislation focused on articulated 2 + 2 programs as the foundation of this effort. Given the way most consortia have implemented Tech-Prep, however, we believe its influence on enrollment in postsecondary institutions is probably limited, for several related reasons.

First, articulated programs of study are relatively rare. Articulation agreements for individual courses are common and the focus of most consortium articulation efforts. Rarely is the linkage of secondary and postsecondary curricula accomplished as part of a more comprehensive program. As a result, the significance of articulation for most students, and even for most faculty involved in negotiating articulation agreements, lies in the possibility of getting credit at the college level for a particular high school course rather than on following a complete career-oriented program that spans the transition from high school to a community college (and beyond, in some cases). There is little evidence that simply defining the conditions under which a student can earn college credit for particular courses taken in high school creates an effective incentive to begin a postsecondary program.

Without structured programs of study that focus on a target occupation or career, Tech-Prep is unlikely to do more than traditional guidance counseling or vocational education in strengthening

students' sense of how their postsecondary education can help them continue preparing for a career. Where Tech-Prep is a set of unconnected curriculum or guidance changes, it is unlikely to enhance students' awareness of links between what they do in high school and further preparation they can pursue at the college level.

In their Tech-Prep implementation, as a result, many consortia have found it inappropriate to stress the continuity between high school and particular college programs. Instead, some consortia and their schools have stressed promoting educational and career planning as a way of encouraging *all* students to prepare for college of some kind. Such planning can be helpful and may encourage some students to go to college who otherwise might not have. However, career-focused programs of study that continually promote the merits of their postsecondary phase--at community colleges, four-year institutions, or training institutes--are more likely to enhance chances that students will make the seamless transition to college that Tech-Prep proponents envisioned. This emphasis on continuity between high school programs of study and their postsecondary extension is uncommon. One observable result is that relatively few students whose schools consider them to be "in Tech-Prep" actually continue to an articulated community college program--the path that Tech-Prep was envisioned as promoting most of all.[2]

c. Involving Students on a Large Scale

Tech-Prep was perceived from the start as potentially filling a need among a broad segment of American youth. Although the legislation laid out no numeric goals, early proponents such as Dale Parnell saw Tech-Prep as an educational model for the "middle majority." Tech-Prep leaders in

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[2]In the one in-depth evaluation site that strongly emphasized continuity from the secondary stage to the community college stage of a career-focused program of study, Tech-Prep students attended community college at a higher rate than in any other site.

many communities contacted in the evaluation talked about Tech-Prep as a way to eliminate the general education track, which in the past involved many students in low-level academic courses and provided no organizing focus for their studies.

At least so far, even with the diverse interpretations of what Tech-Prep is, it has not reached a broad segment of the American student population. The number of students consortia report as participating in Tech-Prep has been increasing, but the most recent estimates, in fall 1995, suggested that Tech-Prep students accounted for, at most, eight percent of high school students in consortium districts. Moreover, many of the students included in this estimate were defined as Tech-Prep students even though the local version of Tech-Prep only marginally altered their school experience (for example, they participated in a single articulated vocational course or in a single applied academic course). The proportion of all high school students who participate in comprehensive Tech-Prep programs of study is much smaller, probably less than one percent.

B. ISSUES AFFECTING THE FUTURE DIRECTION OF TECH-PREP

The question for the future is how to make Tech-Prep more successful and achieve more fully the desired effects on students. Although Tech-Prep has not widely become a coherent program of study, the Tech-Prep legislation and federal funding have been catalysts for important changes. In the long run, the form and consequences of Tech-Prep will be determined by the extent to which policymakers and practitioners address the challenges identified above. Any attempt to address these issues implies confronting three main questions about the future of Tech-Prep.

1. Should Tech-Prep Be a Program?

At the local level, there is presently no strong consensus that Tech-Prep should be a "program"--in the sense of a set of coherently related activities for particular students. Some consortia and

schools do envision Tech-Prep in this way; they are developing career-focused programs of study, and students consciously choose these programs.[3] Many consortia, however, are implementing only pieces of the Tech-Prep model, with no intention of bringing them together for an identified set of participants. As a result, students do not experience what we would call a program. This pattern can be attributed to the preferences of local educators, the effort required to implement Tech-Prep as a program, and the apparent willingness of federal and state officials to allow (and even encourage) diverse interpretations of Tech-Prep. The issue is whether federal or state policy and leadership should encourage greater emphasis on structured, career-focused programs of study. Although current federal law certainly allows consortia and their member schools to continue their varied and often diffuse strategies under the Tech-Prep banner, the federal government and state agencies still have opportunities to promote and encourage particular implementation approaches.

Giving greater emphasis to Tech-Prep as a program of study has two main advantages. First, it is our judgment from field observation that well-defined programs of study are the form of Tech-Prep with the best chance to make high school a more challenging and motivating experience for students. Comprehensive programs of study are a promising model for encouraging students to plan their studies with a focus on the future, to take more (and more advanced) math and science, and to develop solid but broad skills in technology appropriate to their career interests. Programs of study do not need to be called "programs"; they can be called career clusters, career academies, or pathways, but their distinctive feature is the linkage and focus among the components for individual

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[3]A "program" also can refer to an overall framework of objectives and related resources. This definition could be applied to the Tech-Prep program at the federal and state levels. Our concern, however, is how the elements of Tech-Prep are implemented at the local level, where students are directly affected.

students. Isolated or uncoordinated Tech-Prep components are likely to have a more limited impact, if any, on student outcomes.[4]

Second, without programs of study that pull together and focus the elements of Tech-Prep in the experiences of individual students, Tech-Prep loses its distinctiveness and reason for being a separate initiative. For example, if Tech-Prep is solely an effort to introduce applied learning, it is redundant with the mandate in the Perkins Act that emphasizes integration between vocational and academic instruction. If Tech-Prep is primarily a strategy to encourage vocational students to take more math and science--a worthwhile aim--it could be regarded as simply part of a general guidance function. What if Tech-Prep is simply about articulation agreements? Tech-Prep, interpreted this way, can be an important catalyst for getting secondary schools and community colleges to work together--a useful outcome. Given the limited influence of these agreements on students' postsecondary decisions, however, this component alone may not merit separate and distinctive Tech-Prep funding. In addition, an important opportunity to make a substantial difference in individual students' experiences and outcomes may be lost.

2. What Is Tech-Prep's Target Population?

Closely linked to the issue of whether Tech-Prep should be a true program is the question of its target population. Although Tech-Prep was conceived and is still widely viewed as a strategy for

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[4]Our observations on the potential benefits of career-focused, structured programs are supported to some extent by other research. Some evidence suggests that these programs--whether called career academy, youth apprenticeship, or school-to-work programs--may foster a sense of group identity (Flaxman et al. 1997) and increase student motivation to attend school (Kemple 1997). A recent study of a school-to-work transition initiative based on structured programs of study suggests that participants were more likely than their peers to graduate from high school and attend college (Jobs for the Future 1998). The few rigorous studies that have been conducted so far, however, have not shown consistent impacts on the academic performance of students in career-focused programs of study (Urquiola et al. 1997).

the broad middle segment of American students, other perspectives have emerged about the population Tech-Prep is intended to serve. Some proponents view particular elements of Tech-Prep as potentially benefiting all students. Others consider Tech-Prep most appropriate for certain groups (for example, all vocational students or only students interested in technical careers).

Our study suggests that, in most instances where educators view Tech-Prep as for all students, they are unlikely to emphasize the creation of comprehensive career-focused programs of study. Instead, efforts are made to introduce applied academic or contextual learning strategies to a broad set of teachers. However, the relatively limited professional development that can be accomplished with modest Tech-Prep resources means that teaching practices often change only marginally. In contrast, one is more likely to find Tech-Prep as something distinctive--as a program of study with the potential for affecting student outcomes--when the target population and Tech-Prep participants are more clearly and specifically identified.

However, there is nothing inherent in the general idea of a program of study model that precludes its use for a wide range of students. Entire schools could be organized by career clusters (for example, Health and Human Services, Industrial and Engineering Technology, Arts and Communications). Students choosing each cluster could have their studies organized as a career-oriented program of study. Such an approach could have several benefits: (1) schools would be divided into smaller learning environments, where teachers and students would know each other better; (2) opportunities for integrating curriculum would be increased because students would be taking at least some classes with other students interested in similar career areas; and (3) it would allow the natural formation of teacher teams, encouraging greater communication and cooperation on curricula and individual students' progress. These clusters can be defined broadly, to allow for inclusion of students interested in the same industry but who aspire to careers requiring different

levels of postsecondary education. Vocational courses can figure in the options each cluster offers, but not necessarily be the element that creates the career focus for every student.

Some schools, encouraged or supported by Tech-Prep or STWOA funding, are pursuing this strategy. Such school restructuring, however, faces daunting challenges--most clearly the resistance of some parents to having students identify and begin preparing for career goals while in high school. Small schools with a limited range of class offerings face particular obstacles. Thus, for now, Tech-Prep programs of study are most likely to be implemented as an option for students and to be chosen by the subset of students who have formulated a career interest and are willing to organize their studies around it.

3. How Important Are Local Consortia for the Future of Tech-Prep?

Although the Tech-Prep legislation established local consortia of school districts and postsecondary institutions as the cornerstone for program development, the long-term usefulness of these entities should be examined. It could be argued, for example, that most curriculum change associated with Tech-Prep happens within individual districts or even individual schools. It could also be argued that articulation between high schools and colleges requires a bilateral process of a sort that occurred in many states before the advent of Tech-Prep consortia. Tech-Prep funding could flow to schools from state agencies in the same manner as other Perkins funding, rather than through consortia.

We have found, however, that consortia often play useful roles that many individual districts and schools cannot or will not, particularly where the consortium spans a region encompassing multiple districts. Such consortia can take advantage of economies of scale; they can arrange Tech-Prep activities more efficiently for a large group of schools and faculty than could each school or

district on its own. Consortia that play this regional coordinating role successfully have taken on three key functions:

- ***Organizing and Supporting Professional Development.*** Consortia that serve multiple districts have been the key agents for arranging teacher training on Tech-Prep concepts. Professional development workshops and training on topics such as applied or project-based learning usually are supported by Tech-Prep funds and organized by consortium leaders, because districts have limited budgets for professional development and state resources for professional development other than Tech-Prep grants are typically needed for other education reform topics.

- ***Coordinating Employer Involvement.*** Representatives from the business community may participate at either the consortium level (for example, on governing boards) or with individual schools. However, focus group discussions with consortium and employer staff highlight the importance of having a central entity help in promoting the concept of school-employer collaboration, recruiting employers, matching employers with schools or students, and coordinating these efforts so that the burdens on employers are minimized. Many consortia have undertaken these responsibilities on behalf of their member districts.

- ***Facilitating Information Exchange.*** Consortia that span multiple districts play a critical role in helping to develop and disseminate ideas to large numbers of high school and college faculty. Through staff development, the articulation process, and governing board meetings, consortia can foster a spirit of collaboration and offer a chance to share ideas that is broader than could be accomplished within a single school or even a few schools. The consortium can be the force that sustains an ongoing joint process of curriculum review and development beyond what is needed for a one-time articulation agreement, even when there is turnover in relevant faculty positions.

These three roles of the consortium take on particular importance when serious efforts are made to implement Tech-Prep as career-focused programs of study. The emphasis on overall program coherence makes ongoing dialogue between high school and college faculty even more important than when these relationships focus only on aligning particular course curricula. Implementing career-focused programs of study on any significant scale usually requires numerous employers' involvement in curriculum specification or in providing a workplace component.

Tech-Prep funding is not the only way to sustain these useful areawide consortium functions. STW partnerships play similar roles. The roles played by Tech-Prep consortia and STWOA-funded partnerships increasingly overlap. Sometimes, the Tech-Prep consortium and the STW partnership include the same partners and are administered out of the same institution--such as a community college or a school district. STW and Tech-Prep funds are, in fact, sometimes now treated as a single pool of resources to be used for an integrated STW/Tech-Prep agenda.

Maintaining the capacity to perform these consortium functions is important to the future of both Tech-Prep and STW systems. Considerable variation exists in which entity is the best candidate to fulfill these functions. In some places, STW partnerships are considerably larger than Tech-Prep consortia and are too large to provide a framework for ongoing cooperation and interaction. In some areas we have visited, however, STW partnerships have mobilized more support among both educators and employers than the relationships between community colleges and schools that were defined as the basis for Tech-Prep implementation. In many states and local communities, Tech-Prep funding may remain the sole source of support for these collaborative functions, assuming that federal funding for STW partnerships ends as originally planned.

It is clear, however, that not all Tech-Prep consortia as currently defined are well positioned to perform these desirable regional functions. Some consortia are small, essentially consisting of a single school district with just one or two high schools, working with a community college. In these consortia, responsibility for Tech-Prep often is folded into the job of a district supervisor or school board. Where consortia are defined this way, they are unlikely to offer the chief advantages of having a consortium--the regional economies of scale and coordination functions. In other relatively rare instances, consortia that have larger membership serve primarily to pass through Tech-Prep funds to local schools; thus, they also play little coordinating function.

C. STRATEGIES FOR PROGRAM IMPROVEMENT

The national evaluation of Tech-Prep suggests that, although strong Tech-Prep programs exist in some communities, useful steps can be taken to refocus attention of the national Tech-Prep community on the original motivating ideas behind the federal legislation. Since the work of revising the Perkins Act has largely been accomplished, improvements to Tech-Prep over the next several years are more likely to depend on federal and state leadership, rather than on legislative language. We believe there are four ways federal and state agencies could enhance the Tech-Prep concept and its effectiveness:

- Strengthen emphasis on programs of study
- Clarify and focus on "preparatory services" as they pertain specifically to Tech-Prep
- Discourage funding of small, very localized consortia
- Encourage programs of study as a foundation for whole-school change where feasible, but not as the central objective of Tech-Prep

1. Strengthen Emphasis on Programs of Study

In many parts of the country, Tech-Prep needs to "focus on focus." It needs to increase its emphasis on the kind of focused programs that originally distinguished the Tech-Prep concept from vocational education, the general education track, and even most college-preparation tracks in American high schools. Tech-Prep holds the most promise when it is a coherent experience for students, organizing their studies in a purposeful way to achieve a long-term goal through challenging, career-focused programs of study. Other, less focused approaches that we have observed are likely to have less impact, if any, on students' skills and postsecondary transitions. Without an emphasis on programs of study, the need for collaboration across schools and colleges and the rationale for a separate funding stream to support the work of local consortia are diminished.

For these reasons, it is important to promote this approach through federal and state policies and regulations. The U.S. Department of Education can more clearly enunciate its support for this form of implementation. State agencies could be encouraged to make funding of local consortia more dependent on efforts to make structured programs of study a more central feature of Tech-Prep. One implication is that states would be more selective in distributing Tech-Prep funds, favoring consortia that show clear evidence of progress toward this model or clear intent to emphasize it. Ongoing monitoring would focus, in part, on actual progress in implementing structured programs of study.

This recommendation is made with the recognition that, at a superficial level, one consequence might be an apparent drop in levels of participation in Tech-Prep. If this recommendation is widely followed, states might redefine what they mean by Tech-Prep, focusing on a particular model that so far has been implemented on a small scale. Moreover, even if structured programs of study are emphasized and expanded, the segment of the student population that participates is likely to remain more limited than the population of students who could be defined as Tech-Prep participants under the looser definitions now widely used.

Although we recommend concentrating Tech-Prep resources on structured programs of study, we are not suggesting complete abandonment of more disconnected efforts now being made to promote particular elements of Tech-Prep for a broader range of students. However, it may be more effective to promote them through initiatives supported by resources other than designated Tech-Prep funds. For example, efforts to encourage more applied approaches to academic teaching or improve career guidance are likely to attract the support and enthusiasm of a wider range of teachers and counselors if leadership for these efforts comes from agencies and groups that are not associated with vocational education, as Tech-Prep often is. Drawing on funding sources such as the Eisenhower professional development grants and Goals 2000 would underscore the relevance of such

efforts for students in general. In contrast, continuing support for widespread use of Tech-Prep funds to develop the disconnected elements, as if they constitute a program, discourages setting the high standards for Tech-Prep implementation that would justify the hope of affecting student outcomes.

Efforts outside the context of Tech-Prep can also be encouraged to strengthen training of new teachers in applied learning methods. Over the long run, it is inefficient for postsecondary teacher training institutions to ignore the value of applied instructional approaches, leaving Tech-Prep consortia with the persistent challenge of retraining teachers through in-service professional development. If applied and contextual learning strategies truly are beneficial for students, teacher preparation institutions should be pressed to teach future faculty how to use them.

2. Clarify and Focus on the Preparatory Services Central to Tech-Prep

Tech-Prep has helped to generate increased attention to career development activities in some communities, specifically for Tech-Prep students in some cases, but more often for all students. The requirement in the Tech-Prep legislation that consortia provide "preparatory services" has been interpreted in many places as encouragement to help students learn about careers and identify a career interest, in preparation for choosing a Tech-Prep program. Other consortia have translated that mandate into a broad effort to introduce or reintroduce career development activities for all students; sometimes this effort constitutes the major thrust of what is called Tech-Prep, even when there is no clear link between the general career awareness activities and the choice of a program of study.

If our recommendation to focus Tech-Prep more on developing and expanding structured programs of study were heeded, it would probably then be appropriate to shift the way Tech-Prep resources are used for preparatory services. It would then make sense to use Tech-Prep resources to reinforce and support those programs of study rather than to promote or reorganize comprehensive

career guidance in general. In part, this is an issue of limited resources--with a given amount of funds, Tech-Prep consortia might find it difficult to support both this broad career guidance effort and the primary Tech-Prep agenda (programs of study that include applied learning and articulation).

Efforts to focus preparatory services on promoting student success in Tech-Prep programs of study should serve four objectives:

- Attract students' interest in challenging programs of study
- Prepare students for those programs
- Help them stay in the programs
- Assist them in moving on to postsecondary education

Examples of such uses of preparatory services already exist, and we have observed them in this evaluation. For example, consortia make presentations to students about programs of study and provide job shadowing experiences to expose students with some expressed interest in a career area to the related program of study. Consortia arrange visits to colleges to observe the postsecondary components of comprehensive programs of study, and some arrange special tutoring in math and science for participating students.

3. Discourage Funding of Small, Very Localized Consortia

Many Tech-Prep consortia play important roles for the communities they serve, providing momentum and assistance for Tech-Prep (and even for broader reforms). The benefits of consortia, however, are most evident when the consortia are multidistrict, or encompass a single district that is large, and carry out tasks that individual districts or schools could not do on their own. When a state simply divides Tech-Prep funds among consortia that represent single smaller districts, grant amounts are small and may be insufficient to foster ambitious Tech-Prep efforts. The opportunity

to use Tech-Prep resources to encourage the regional benefits described earlier--cooperation, exchange of information, and economies in professional development--is also lost when the consortium's primary role is to pass through funds to individual districts and schools.

4. Encourage Programs of Study as a Foundation for Whole-School Change Where Feasible

The idea of organizing high school studies around a career theme can potentially benefit a wide range of students. Tech-Prep resources (as well as STW resources) could be well spent, in particular schools or districts where circumstances are favorable, on developing adaptations of the Tech-Prep program of study model for all students. In the context of whole-school reform, the programs of study would have to be broadly defined, to include professional as well as technical and semiskilled occupations. Occupational courses also might have to be broadened, perhaps using Perkins funds to move away from narrow skills training. For example, career clusters could include "context" courses that introduce students to terminology and broadly applicable skills and provide a forum for conveying information about career paths and postsecondary education options, as well as the social, management, and technological implications of relevant industries. Career clusters or broad programs of study would logically all include a common core of academic courses, to allow students a certain degree of flexibility to transfer among them. Workplace experiences of varied types and intensity might be arranged for all students interested in the same broad career area. This adaptation of the program of study model as a foundation for whole-school reform probably would closely resemble the career major concept promoted in the STWOA. If implemented around broadly defined career or industry clusters, with explicit strategies to include students of all ability levels in every career cluster, and to avoid blocking students' pursuit of eclectic interests, concerns over constraints on students' educational options would likely abate.

Interest in extending the career-focused program of study to all students, however, should not outweigh the importance of insisting that Tech-Prep be meaningful for those who participate. The increasing number of schools interested in organizing education for all students around career-oriented programs of study is promising, but it is unlikely that all or most schools will adopt this strategy. We recommend persistence in developing Tech-Prep programs of study as an option for some students in most schools, to maximize chances of strengthening their success in school, their transition to fruitful postsecondary pursuits, and their sense of career direction for the future.

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